



EdWorkingPaper No. 24-1080

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VERSION: November 2024

Suggested citation: Moran, Alex J. (2024). Teacher-colleague race congruence and mobility: Do colleague demographics impact teacher retention?. (EdWorkingPaper: 24 -1080). Retrieved from Annenberg Institute at Brown University:
<https://doi.org/10.26300/9ej4-bd02>

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Teacher turnover is especially pronounced among teachers of color who play critically important roles in the success of students of color. A growing literature points to racial isolation as one factor that is associated with Black teacher job satisfaction in particular, which in turn could play a role in a teacher's decision to remain in a school. However, little is known about whether having more race-congruent colleagues might be a potential mechanism that leads teachers to stay, and whether that relationship might vary by teacher race. Drawing on statewide administrative data from Pennsylvania, I examine the extent to which colleague racial congruence impacts the likelihood of teacher turnover and what transferring teacher's destination schools imply about their revealed preferences for colleague race congruence and other factors. Using a series of fixed effects models to account for within- and between-school teacher sorting, I find that a 10 percentage point increase in racially congruent colleagues decreases the likelihood of teacher turnover by 6% of a standard deviation, with larger impacts for Black teachers (0.09 SD) than for White teachers (0.03 SD). However, nonlinear models point to diminishing returns to greater race congruence, as the marginal effect of additional race congruence attenuates to close to zero as a teacher crosses the 50% race congruence threshold. Transferring teachers appear to select into schools with greater proportions of racially congruent colleagues, suggesting a revealed preference for colleague demographics—but again only to a point.

Teacher-colleague race congruence and mobility: Do colleague demographics impact teacher retention?

While extensive literature shows that student-teacher and teacher-principal race congruence have a wide range of benefits for students and teachers (Chi, 2022; Dee, 2005; Egalite et al., 2015; Grissom & Keiser, 2011; Harbatkin, 2021; Joshi et al., 2018; Lindsay & Hart, 2017), comparatively little is known about whether there may be positive effects of teacher-teacher racial congruence. However, there is reason to believe that many of the same mechanisms that underlie the positive effects of teacher-student and teacher-principal race congruence may also promote positive effects of teacher-teacher race congruence. For example, students who are exposed to a same-race teacher see an increase in self-efficacy (Blazar, 2024), an important characteristic for teacher job satisfaction and retention (Zee & Koomen, 2016). An emerging research base provides evidence that the demographic makeup of both students and staff may indeed contribute to teacher retention. In particular, Black teachers are less likely to turn over when they work in schools with a Black principal and with greater proportions of Black students (Bartanen & Grissom, 2021; Grissom & Keiser, 2011; Sun, 2018).

Existing work on teacher-colleague race congruence (i.e., other teachers in a teacher's school who share racial identity) suggests that teachers may further benefit from having more racially congruent colleagues. Recent descriptive work suggests that increases in racially congruent colleagues are associated with decreases in turnover (Bristol, 2018; Bruno et al., 2020; Rodriguez et al., 2022; Strunk & Robinson, 2006; Xu et al., 2024). I build on this prior work by aiming to provide the first causal effects of teacher-teacher racial congruence on turnover. Specifically, I leverage statewide longitudinal data from Pennsylvania to examine these effects overall and by teacher race. I then extend prior research on racially congruent colleagues by

examining whether teachers who do transfer appear to select into schools with more racially congruent colleagues. To examine these relationships, I ask the following questions:

1. To what extent does the share of racially congruent colleagues within a school impact the likelihood of teacher turnover?
2. To what extent does this impact vary across teacher racial identities?
3. For teachers who transfer, to what extent does their destination school imply a revealed preference for colleague race congruence?

Drawing on statewide administrative data from Pennsylvania and using quasi-experimental methods leveraging within-teacher and within-school variation in colleague race congruence, I find that having more racially congruent colleagues is associated with a small but significant decrease in the likelihood of teacher turnover, with the largest effect sizes for Black teachers. In addition to a reduction in turnover, I also find that transferring teachers appear to transfer to schools with greater proportions of racially congruent colleagues, suggesting a revealed preference for colleague demographics, though they may prioritize fundamental preferences such as working conditions and resources in certain circumstances. In both the retention and transfer cases, I find that there is an inflection point; teachers do not necessarily prefer complete racial homogeneity in colleagues.

The remainder of this paper proceeds as follows. First, I overview the literature on mechanisms that contribute to teacher turnover and racial congruence, in particular. Next, I describe the fixed effects models I use to isolate a plausibly causal relationship between racially congruent colleagues and teacher turnover and the descriptive models I use to examine transferring teachers' revealed preferences. I move next to findings organized by research

question. I conclude with a discussion of the importance of these findings and policy implications for school, district, and state education leaders.

Literature Review

A large literature documents the problematic levels of teacher turnover across the country generally (Bastian & Fuller, 2023; Bleiberg & Kraft, 2023; Camp et al., 2022; Goldhaber & Theobald, 2023; Harbatkin et al., 2023) and especially for teachers of color (Bacher-Hicks et al., 2023; Carver-Thomas & Darling-Hammond, 2017). On average, about 8% of the teacher workforce leaves the profession, and another 8% moves to another teaching position (Carver-Thomas & Darling-Hammond, 2017; Nguyen, 2021). When asked about these decisions, teachers cite poor school climate, ineffective leadership, and student discipline challenges as reasons for leaving (Carver-Thomas & Darling-Hammond, 2017; Harbatkin et al., 2023; Kraft et al., 2016; Nguyen et al., 2020; Redding & Nguyen, 2024).

While there is a large research base describing how and why teachers *leave* schools, a smaller but growing body of work observes where those teachers go after they transfer (Boyd et al., 2011; Kho et al., 2022; Pham, 2023; Sun, 2018; Viano et al., 2021). Teachers report that they prefer schools with fewer discipline issues and greater safety, increased pay, stronger administrative support and professional development, and more supportive teacher relationships, among others (Harbatkin et al., 2023; Horng, 2009; Strunk et al., 2022; Viano et al., 2021), and this appears to be supported by actual transfer decisions, as teachers transfer to schools that align with their preferences (Boyd et al., 2011; Pham, 2023; Sun, 2018; Viano et al., 2021).

Mechanisms for Decreasing Teacher Turnover

Research suggests that potential mechanisms, such as supportive teacher relationships and teacher cooperation (Johnson et al., 2012; Kraft et al., 2016; Nguyen, 2021; Viano et al.,

2021), demographic congruence with colleagues (Bartanen & Grissom, 2021; Grissom & Keiser, 2011), and demographic congruence with students (Strunk & Robinson, 2006; Sun, 2018) may be important for decreasing turnover among teachers—especially teachers of color. A study on teachers in New York City middle schools found that better teacher-teacher relationships were associated with a decreased probability of turnover (Kraft et al., 2016), and a nationally representative study found similar results in that increases in the quality of teacher cooperation decreased the likelihood of teachers moving from their positions (Nguyen, 2021).

A large and growing literature points to positive effects of demographic congruence of teachers with principals and students (Chi, 2022; Grissom & Keiser, 2011; Sun, 2018). Using school fixed effects and propensity score matching, Grissom and Keiser (2011) found that teacher-principal racial congruence is associated with higher teacher satisfaction levels and lower teacher turnover. This result was heavily driven by Black teachers, suggesting that—in line with the literature on student-teacher race congruence—racial congruence among colleagues might be most salient for Black teachers. Relatedly, Sun (2018) found that, in North Carolina elementary and middle schools, Black teachers were more likely to stay in their schools when there were higher percentages of Black students. Together, these findings suggest that teachers may be more inclined to remain in their schools when there are greater numbers of individuals (i.e., staff or students) who share their racial identity.

Racial Congruence

While there is evidence that teacher-student and teacher-principal racial congruence may improve teacher retention, a few studies thus far have examined how teacher-*colleague* racial congruence might contribute to teacher retention, though none have attempted to isolate a plausibly causal effect (Bristol, 2018; Bruno et al., 2020; Rodriguez et al., 2022; Strunk &

Robinson, 2006; Xu et al., 2024). Descriptive work suggests that teachers who are exposed to greater shares of racially congruent colleagues report greater job satisfaction (Bristol, 2018; Fairchild et al., 2012) and are less likely to leave their schools (Bruno et al., 2020; Strunk & Robinson, 2006). Specifically, papers using Los Angeles Unified School District administrative data (Bruno et al., 2020) and the 1999-2000 Schools and Staffing Survey/2000-2001 Teacher Follow-Up Survey (Strunk & Robinson, 2006), respectively, found that increased racial congruence is associated with a decrease in the likelihood of teacher turnover. Specifically, Strunk & Robinson (2006) used a 2-level hierarchical general linear model to show that a one percentage point increase in Black teachers at a given school reduced the likelihood of turnover for Black teachers by 1.7 percentage points. An analysis of New York City teachers used school fixed effects to identify an effect of colleague racial congruence and found that the likelihood of turnover decreased by 2.3pp given a one percentage point additional exposure to racially congruent colleagues, with a larger decrease (3.5pp) for Black teachers (Rodriguez et al., 2022). These findings are further supported by a recent study in Tennessee that used teacher, school, and district-by-year fixed effects and a coarse measure of racially congruent colleagues (i.e., solo teacher, <15% same race/ethnicity, 15%-40% same race/ethnicity, and 41%-100% same race-ethnicity), which found that a Black teacher who works with no racially congruent colleagues is about 5pp more likely to leave their school compared with a Black teacher who works with 41%-100% racially congruent colleagues (Xu et al., 2024).

A broader literature on teacher peer effects suggests some potential mechanisms that may contribute to these findings, with teacher peers having positive or negative influences. For example, teachers experience increased effectiveness when exposed to more effective colleagues (Jackson & Bruegmann, 2009; Papay et al., 2020; Sun et al., 2013), and White teachers gain

racial competency when working with Black colleagues (Gershenson et al., 2023). Peers also influence teachers to mirror behavior, including the likelihood of attendance and financial decisions (Bradley et al., 2007; Maturana & Nickerson, 2019). In sum, within-school peers hold a meaningful influence on teachers, not only for within-classroom outcomes but also for behavioral and career outcomes.

While there is growing evidence that teacher-colleague race congruence has the capacity to improve teacher retention (Rodriguez et al., 2022; Xu et al., 2024), the research does not suggest a move toward a homogenous teacher workforce (e.g., Gershenson et al., 2023). Racially segregated schools disadvantage both students and teachers, as students of different racial identities can influence the attitudes and behaviors – particularly surrounding perceptions of race and ethnicity – of their peers (Billings et al., 2021; Carrell et al., 2019), while teachers can benefit by learning from and experiencing different perspectives (Gershenson et al., 2023). Therefore, there is reason to believe that there are benefits to an increase of racially congruent colleagues, but that, at the extremes, there might be costs that outweigh the benefits.

In sum, there is growing evidence that teacher-colleague race congruence may contribute to decreased turnover, though most of the research is associational, and even less is known about teachers' revealed preferences concerning colleague race congruence. In the following sections, I detail how my empirical approach isolates a plausibly causal effect of teacher-colleague race congruence, and describe the descriptive methods unpacking the revealed preferences of teachers who transfer schools.

Data, Sample, and Methods

Data

I answer the three research questions using statewide administrative data from Pennsylvania, maintained and made available by the Pennsylvania Department of Education (PDE). The publicly available Professional Personnel Individual Staff Report contains longitudinal data on all Pennsylvania public school employees including teacher-by-year data on gender, education level, teaching experience, and school assignment. Race/ethnicity is hidden from the data files on the public website, so I requested and received this information from the PDE Data Quality Office. I draw on data from 2013-14—the first year of data that allows for longitudinal tracking of teachers—through 2019-20 to examine teacher mobility up until the onset of the COVID-19 pandemic. Beginning with this PDE teacher-level data, I merge in school characteristics, including locale and school level (i.e., elementary, middle, high, other), along with school-level student gender, race/ethnicity, and economically disadvantaged counts from the Common Core of Data (CCD). I also merge school-level English learner (EL) and special education counts obtained from the PDE Data Quality Office.

Sample

The sample for this study includes all full-time teachers who worked in a Pennsylvania traditional public school¹. between the 2013-14 and 2019-20 school years. I restrict my sample to just those teacher-years with only one school assignment by excluding all observed years for a teacher assigned to multiple schools at any point during the study period (Camp et al., 2023; Harbatkin et al., 2023; Henry & Redding, 2020) and to just those observations with a complete set of covariates. Because 98% of the teacher workforce in Pennsylvania is Black or White and

¹ I exclude charter schools for my main analytic sample but provide results for models including charter schools in Appendix A

no other subgroup accounts for more than 1% of the teacher population, I further restrict my sample to just Black and White teachers. My final analytic dataset contains 652,519 teacher-year observations for 109,800 unique teachers across 2,901 unique schools during the study period. Table 1 provides descriptive statistics for the full population in Column 1 followed by the main analytic sample in Columns 2–4, highlighting that the analytic sample is largely similar to the total population. On average, teachers in the analytic sample are slightly more experienced (14.5 vs. 13.8 years of experience) and work in schools that have lower enrollment and slightly fewer Black students than the full population of Pennsylvania teachers. In total, Panel A shows that the teachers in my analytic sample are about 96% White, 4% Black, and 26% male, with an average teaching experience of about 14.5 years. About 57% have some form of a graduate degree (i.e., Master's, Doctorate, or Specialist).

To answer my third research question, I further restrict my analytic sample to include only teachers who transferred schools between years t and $t+1$. Column 5 of Table 1 provides a comparison of this transferring teacher sample to the full analytic sample used in research questions 1 and 2. Panel A shows that the transferring teacher sample is twice as likely to be Black, has about 25% fewer years of teaching experience, and is about 16% less likely to have a graduate degree than the overall analytic sample. Teachers in this sample work in schools with more teacher-colleagues of color and more students of color than the overall analytic sample and with larger populations of economically disadvantaged students, special education students, and English learners.

[Table 1]

Measures

Teacher Mobility

Following prior teacher turnover research (Harbatkin et al., 2023; Ladd, 2011; Nguyen, 2021), I categorize employment decision status for teachers in year t into three mutually exclusive categories: stayers, transfers, and leavers. Stayers are teachers who remain in the same school in year $t+1$ as year t , transfers are those who switch to a different school in year $t+1$, and leavers are those who no longer appear in the dataset in year $t+1$. I examine three dichotomous outcomes based on these categories—(1) transfer, which takes a value of 1 for transfers and 0 for leavers and stayers; (2) leaver, which takes a value of 1 for leavers and 0 for transfers and stayers, and (3) leave for any pathway out, which takes a value of 1 for both transfers and leavers and 0 for stayers.

Panel B of Table 1 shows that overall turnover is 8%, on average, but almost twice as high for Black teachers (14.7%) as for White teachers (7.7%). A little more than half of overall turnovers are transfers, on average, but there are again differences by racial identity. Black teachers transfer at an average of 9.8% and White teachers transfer at a rate of 4.6%, highlighting that if a Black teacher leaves, it is more likely to be a transfer than for when a White teacher leaves.

Independent Variables of Interest

To examine the effects of teacher-colleague race congruence on turnover, I draw from the state's teacher race/ethnicity variable and construct a measure of the share of racially congruent teacher colleagues within each teacher's school and year. I begin with the total number of teachers (including all teachers in the original sample in Column 1 of Table 1, i.e., all teachers regardless of race) and the number of teachers of each racial identity in each school-year

observation, and then calculate the proportion of racially congruent colleagues for each teacher i . This measure will be the proportion of same-race *colleagues* in school s and year t , constructed as a leave-one-out, or jackknife, measure (Chetty et al., 2014; Harbatkin et al., 2023; Kraft et al., 2021) that excludes the observed teacher. Following prior work on teacher-colleague race congruence, (Bruno et al., 2020; Rodriguez et al., 2022; Strunk & Robinson, 2006), I operationalize this race congruence measure as linear in my main models. However, I run additional analyses using a quadratic function of colleague race congruence and a non-parametric operationalization to allow for a nonlinear relationship between race congruence and turnover.

Panel C of Table 1 shows that the average teacher in my sample is exposed to 3.2% Black teacher colleagues and 95% White teacher colleagues. However, this varies substantially across racial identity, as teachers cluster more with racially congruent teachers. The average Black teacher is exposed to 24% racially congruent colleagues (i.e., other Black teachers) and 71% White teacher colleagues, while the average White teacher is exposed to 96% racially congruent colleagues (i.e., other White teachers) and 2.5% Black teacher colleagues.

Figure 1 unpacks the distributional differences in the proportion of racially congruent colleagues, highlighting that White teachers work predominantly with other White teachers and Black teachers work with a range of proportions of racially congruent colleagues. Importantly, no Black teachers in my sample work with greater than 80% racially congruent colleagues. An important takeaway here is that Black teachers work with a majority of colleagues who are not of the same race, while White teachers tend to work with almost exclusively other White teachers (as shown in Figure 1).

[Figure 1]

Covariates

I calculate several school-level measures of student characteristics, including the percentage of students in each race/ethnicity identity category (i.e., Black, Hispanic, White, and American Indian/Asian/multi-racial/Native Hawaiian), as well as the percentage of students who are economically disadvantaged (defined by the state as the share of students eligible for free or reduced-price lunch), classified as special education students,² and classified as English learners, respectively. I operationalize school size as a logged function of student enrollment, create a series of school grade level indicators (i.e., elementary, middle, high, other), and draw on locale codes to generate dummy variables for city, suburban/town, and rural school urbanicity. I include these school-level covariates to control for student demographic factors that might be associated with both the assignment of teachers to schools and with the likelihood of teacher turnover (Boyd et al., 2005; Hanushek et al., 2004; Scafidi et al., 2007). I also include an indicator for teacher-principal race congruence to control for any effects on turnover stemming from this relationship (Chi, 2022; Grissom & Keiser, 2011). This indicator will take a value of 1 if the teacher and principal share the same race/ethnicity identity in school s and year t ; otherwise, it will take a value of 0.

Analytic Strategy

My first research question aims to identify the effect of colleague racial congruence on teacher turnover. The primary identification challenge is that teachers are not randomly assigned to schools or students within schools (Goldhaber et al., 2015; Jackson, 2009), so a simple comparison of turnover by teacher-colleague race congruence could be biased by unobserved

² The PDE masks the number of special education students if the n-size is less than 10 students. For these schools, I set the proportion of special education students in that school to be 0.001 and include a separate dummy variable indicating that this school-year cell was masked by PDE.

differences in school settings and working conditions that are also associated with teacher-colleague race congruence. I aim to account for this bias with models predicting each of my three turnover outcomes (i.e., transfer, leave, leave school for any pathway out) as a function of teacher, school, and year fixed effects and covariates. Specifically, following a large literature examining relationships between teacher working conditions and teacher turnover (e.g., Harbatkin et al., 2023; Nguyen, 2021; Rodriguez et al., 2022) and for ease of interpretation, I run linear probability models that take the form:

$$Y_{ist} = \beta_0 + \beta_1 Congruence_{ist} + \alpha \mathbf{X}'_{ist} + \gamma \mathbf{Z}'_{st} + \sigma_i + \phi_s + \pi_t + \varepsilon_{ist} \quad (1)$$

where Y is an indicator that takes a value of 1 if teacher i turned over (i.e., over three separate models: transferred, exited, or turnover for any pathway out, respectively) from school s in or at the end of year t . *Congruence* is a measure of teacher i 's race congruence with their colleagues in school s in year t . \mathbf{X}' is a vector of time-varying teacher characteristics, including a nonlinear function of teacher experience (i.e., 3 or fewer years, 4-10 years, 11-20 years, and more than 20 years) and a graduate degree indicator. \mathbf{Z}' is a vector of time-varying school characteristics, including a logged function of enrollment and the proportion of students who are economically disadvantaged, ELs, designated for special education, different race/ethnicity groups, and an indicator for a racially congruent principal, respectively. The model also includes teacher (σ_i), school (ϕ_s), and year (π_t) fixed effects, and an idiosyncratic error term clustered at the teacher level (ε_{ist})³.

The school fixed effects control for unobservable time-invariant school characteristics that might be associated with the proportions of Black versus White teachers and the likelihood of turnover. For example, if Black teachers are more likely to work in schools with worse

³ Additional models with error terms clustered at the school level provide similar inferences and are available upon request

working conditions, they might be exposed to more racially congruent colleagues and more likely to turn over, while White teachers who are at schools with better working conditions are also exposed to more racially congruent colleagues but *less* likely to turn over. In this case, estimates from models without school fixed effects would be biased downward for Black teachers and upward for White teachers.

Models with school fixed effects may still produce biased estimates because students are not randomly assigned to teachers within schools (Clotfelter et al., 2006; Goldhaber et al., 2015). For instance, Black teachers are more likely to teach lower achieving students and, therefore, potentially more likely to turn over, especially if they do not receive the resources necessary to adequately support those students (Clotfelter et al., 2006; Harbatkin et al., 2023). To control for this within-school teacher sorting, I include teacher fixed effects, which mitigates this endogeneity problem by comparing whether a given teacher turns over in a given year when they have a given share of race-congruent colleagues with the probability of that same teacher turning over across all observed years. Teacher fixed effects on their own may still produce biased estimates because they do not account for teacher sorting across schools. Therefore, my preferred specification includes *both* teacher and school fixed effects, though I also run separate school fixed effects and teacher fixed effects models.⁴ Additionally, I include year fixed effects to control for time factors that may confound my findings, such as labor market fluctuations or large-scale state or federal policy developments (e.g., the signing of ESSA in 2015).

To facilitate interpretation, I rescale the 0-1 race congruence variable so that a one-unit change in the variable represents a 10 percentage point change in racially congruent colleagues.

⁴ In models with teacher fixed effects, I also include time-invariant school characteristics, including school grade level band (i.e., elementary, middle, high) and locale (i.e., urban, suburban/town, rural). In models with school fixed effects only, I include time-invariant teacher characteristics, include an indicator for male teacher and an indicator for Black teachers.

Thus, because I am using a linear probability model, the estimate on β_1 , the coefficient of primary interest, represents the estimated change in the probability of turnover associated with a 10 percentage point increase in racially congruent colleagues. For the models predicting turnover, regardless of pathway, estimates are relative to remaining in the school. For the models predicting leaving the Pennsylvania dataset, estimates are relative to staying in education, including staying at the same school or transferring. In the model predicting transfer, I include a dichotomous indicator variable for leaving the Pennsylvania dataset so that the estimates in the transfer models are also relative to remaining in the school. In addition to Equation 1, I also run two supplemental models replacing the linear race congruence variable with quadratic and non-parametric operationalizations, respectively, of the racially congruent colleagues variable to allow for a nonlinear relationship between racially congruent colleagues and turnover. As mentioned above, I provide findings for models with the inclusion of charter schools in Appendix A.

Next, to answer my second research question about differences by teacher race/ethnicity, I follow prior research (Harbatkin, 2021; Joshi et al., 2018) in creating two different race congruence variables—one for Black teachers and one for White teachers (i.e., race congruence for Black teachers and race congruence for White teachers). For example, the *Black x Congruence* variable takes the race congruence value for Black teachers and a value of zero for White teachers. The *White x Congruence* variable takes the race congruence value for White teachers and zero for Black teachers. I replace the singular *Congruence* variable from Equation 1 with *Black x Congruence* and *White x Congruence*. This model takes the following form:

$$Y_{ist} = \beta_0 + \beta_1(\text{Black} \times \text{Congruence})_{ist} + \beta_2(\text{White} \times \text{Congruence})_{ist} + \alpha \mathbf{X}'_{ist} + \gamma \mathbf{Z}'_{st} + \sigma_i + \phi_s + \pi_t + \varepsilon_{ist} \quad (2)$$

Because I restrict the sample to just Black and White teachers, the estimate on β_1 represents the estimated change in the probability of turnover for a Black teacher associated with a 10 percentage point increase in racially congruent colleagues and β_2 represents the change in the probability of turnover for a White teacher associated with a 10 percentage point increase in racially congruent colleagues. In both cases, the coefficient is in reference to teachers of either race with 0% race congruence. My preferred model uses this interaction specification to maximize power, though I also rerun Equation 1 for only Black teachers and again for only White teachers, for which findings can be found in Appendix C. The rest of the model follows Equation 1. As above, findings with the inclusion of charter schools can be found in Appendix A.

Finally, to answer my third research question about teachers' revealed preferences for colleague race congruence, I descriptively examine differences between the proportion of racially congruent colleagues in a teacher's original school before they transfer (i.e., school in year t) and their destination school after they transfer (i.e., school in year $t+1$). Because I am interested in comparing characteristics from original schools to destination schools after a transfer, I restrict the sample to include only teacher-year observations that transfer schools between year t and year $t+1$ (i.e., last column of Table 1). I then run the following model:

$$Congruence_{ist+1} = \beta_0 + \beta_1 Congruence_{ist} + \alpha \mathbf{X}'_{ist} + \gamma \mathbf{Y}'_{st,t+1} + \pi_t + \varepsilon_{ist} \quad (3)$$

where $Congruence_{ist+1}$ is the proportion of racially congruent colleagues for teacher i entering destination school s in year $t+1$, $Congruence_{ist}$ is the proportion of racially congruent colleagues in the original school in year t , \mathbf{X}' is a vector of time-varying teacher characteristics (measured in year t) as described in Equations 1 and 2 above, along with stable teacher characteristics described in footnote 4 above. \mathbf{Y}' is a vector of time-varying and non-varying school

characteristics (again as described in Equations 1 and 2 and footnote 4 above) of both the original school in year t and the destination school in $t+1$. Again, π_t represents year fixed effects and ε is an idiosyncratic error term clustered at the original school level. The coefficient of primary interest, β_1 , can be interpreted as the difference in the proportion of racially congruent colleagues in a teacher's destination school compared with their original school, after controlling for observable school characteristics of both the original and destination schools and other covariates. The estimate on β_1 should therefore be purged of observable school-level characteristics and reflect the extent to which transferring teachers select into greater or lesser colleague race congruence after accounting for these other differences between the original and destination schools. Still, the estimate should be interpreted as associational because it does not account for unobserved school factors (e.g., climate, working conditions, school leader quality) that also contribute to teachers' decisions. To facilitate the interpretation of these results, I estimate the marginal effects of the proportion of racially congruent colleagues in year $t+1$ (i.e., destination school) and plot them on the y-axis with the proportion of racially congruent colleagues in year t (i.e., original school) on the x-axis. In this plot, the diagonal represents a one-to-one tradeoff in racially congruent colleagues. Therefore, marginal effects above the diagonal would suggest that at a given level of race congruence in their original school, transferring teachers are trading for a greater share of race congruence in their destination school after controlling for other factors. Marginal effects below the diagonal would suggest that transferring teachers are selecting into a lesser share of race congruence.

I next supplement Equation 3 by examining how this relationship differs across the racial identity of the transferring teacher. To do so, I add an interaction between *Congruence* and *Black*, with the model taking the form:

$$Congruence_{ist+1} = \beta_0 + \beta_1 Congruence_{ist} + \beta_2 Black_i + \beta_3 (Congruence \times Black)_{ist} + \alpha X'_{ist} + \gamma Y'_{st,t+1} + \pi_t + \varepsilon_{ist} \quad (4)$$

Here, *Congruence x Black* allows for the relationship between race congruence in year t and $t+1$ to vary by teacher race. All other components are the same as described above for Equation 3. The coefficients of primary interest are β_1 and β_3 , with β_1 representing the estimated change in racially congruent colleagues in the destination school associated with a change in the original school for White teachers, and β_3 denoting the difference over and above β_1 for Black teachers. I then plot the marginal effects from these models by race.

Findings

Race Congruence

Table 2 presents the results of the linear probability models examining the effect of the proportion of racially congruent colleagues on the likelihood of teacher turnover. Panel A presents results for the change in the likelihood of leaving for any pathway, Panel B presents results for the change in the likelihood of transferring to another teaching role at a different school, and Panel C shows results for the change in the likelihood of leaving the PA dataset.

[Table 2]

Column 4, my preferred specification because it includes both teacher and school fixed effects, shows that a 10 percentage point increase in racially congruent colleagues decreases the likelihood of turnover by 1.7pp. In real terms, this means that a 1 standard deviation increase in the proportion of racially congruent colleagues (i.e., 15.5%) would decrease the likelihood of turnover by 2.6pp, on average. Examining across columns within each respective panel, models without teacher fixed effects appear to underestimate the impact of racially congruent colleagues on teacher retention, that is the models without teacher fixed effects do not account for unobserved

differences between teachers that bias the estimates for models with only school and year fixed effects.

Panel B in Table 2 shows that the findings for overall turnover are largely driven by decreases in teacher transfer, as a 10 percentage point increase in racially congruent colleagues decreases the likelihood of transfer, relative to staying in their school, by 1.5pp. That translates into an effect of 2.3 pp given a 1 standard deviation increase in the proportion of racially congruent colleagues. Meanwhile, Panel C shows that the effects on leaving PA education are small and only marginally significant, though the overall leaving PA education rate is only 3.2% compared to this 0.2pp decrease in the likelihood of leaving PA education.

Figure 2 presents the marginal effects associated with Panel A of Table 2, along with marginal effects from the results shown above (Panel A), followed by models that replace the linear race congruence variable with a quadratic (Panel B) and a spline function (Panel C) of race congruence. Tables for the supplemental operationalizations can be found in Appendix B and figures for the transfer and leave outcomes are presented in Appendix D. These supplemental models support the findings from the linear model but also show diminishing returns of racially congruent colleagues.

[Figure 2]

These findings, which include only teachers in traditional public schools, are robust to the inclusion of teachers who work in charter schools, as shown in Appendix A.

Heterogeneity by Teacher Race

Table 3 shows the estimates from Equation 2, which allows for differential effects by teacher race. I find that the positive effects of colleague race congruence on retention are three times larger for Black teachers than White teachers. My preferred specification (i.e., column 4)

shows that White teachers see a 1.0pp decrease in the likelihood of any turnover for a 10 percentage point increase in racially congruent colleagues, on average, while Black teachers experience a 3.2pp decrease in the likelihood of any turnover. These coefficients for Black teachers and for White teachers are significantly different at the .001 level ($F(1, 109,799)=10.81$). Similar to my overall findings above, this relationship appears to be driven primarily by transfers, as opposed to leaving the PA dataset. Findings for supplemental operationalizations (i.e., quadratic and non-parametric) can be found in Appendix B.

[Table 3]

Revealed Preferences for Transferring Teachers

My final research question aims to examine how the characteristics of a transferring teacher's original school compare with the characteristics of their destination school. In particular, I aim to unpack the revealed preferences of transferring teachers, with respect to the proportion of racially congruent colleagues.

Figure 3 provides marginal effects for the model shown in Equation 3, across three different operationalizations of the original school teacher race congruence variable: linear (Panel A), quadratic (Panel B), and non-parametric spline (Panel C). This shows the predicted proportion of racially congruent colleagues at a transferring teacher's destination school (y-axis) compared with the proportion of racially congruent colleagues at their original school (x-axis). The dotted red diagonal line represents a 1:1 relationship between the proportion of racially congruent colleagues at the original school and destination school; put another way, a teacher who transferred to a school with exactly the same share of race-congruent colleagues as their original school would be precisely on the diagonal. Thus, if teachers at a given level of colleague race congruence in year t tend to transfer to destination schools with *more* racially congruent

colleagues than their original school, the marginal effect will be above the red dotted line. If teachers at a given level tend to transfer to destination schools with *fewer* racially congruent colleagues than their original school, the marginal effect will fall below the red line.

[Figure 3]

As shown in Figure 3, across the range of racially congruent colleagues in a transferring teacher's original school, teachers tend to transfer to destination schools with a greater proportion of racially congruent colleagues. However, Panel A suggests that when teachers have about 87% or more racially congruent colleagues in their original school, on average, they transfer to schools with fewer racially congruent colleagues. Panel B and Panel C again suggest a diminishing relationship, with an inflection point between 30% and 40% race congruence of the original school. While these findings are to some extent explained by ceiling effects, they provide some suggestive evidence—especially in combination with the diminishing returns to race congruence on teacher retention in RQ1—that teachers have a preference for some diversity in colleagues, all else equal.

While the overall relationship above provides insight into transferring teachers' revealed preferences on average, there is reason to believe that Black and White teachers might have different preferences (Bacher-Hicks et al., 2023; Carver-Thomas & Darling-Hammond, 2017). Figure 4 presents marginal effects results from Equation 4, where I allow for differences by teacher race. This figure follows the same format as Figure 3 but denotes estimates for White teachers with circles and Black teachers with diamonds. Given the differences in colleague race congruence by teacher race shown in Figure 1 (i.e., few Black teachers are in school with more than 80% Black colleagues), there are insufficient Black teachers in the transferring teacher

sample for in-sample predictions at greater than 80% racial congruence in the original school. In these cases, I show out-of-sample predictions in dashed rather than solid lines.

[Figure 4]

Panel A shows that when White teachers transfer, they tend to select into greater racial congruence regardless of the racial congruence of the school they transferred from. Black teachers, on the other hand, select into more racial congruence when they are transferring from a school with lower levels of racial congruence—but not when they are transferring from a school with higher levels of racial congruence. Specifically, Black teachers who work in a school with less than 40% racially congruent colleagues tend to transfer to schools with a greater share of racially congruent colleagues, but those who work in schools with greater than 40% tend to transfer to schools with fewer racially congruent colleagues.

Panel B and Panel C once again provide more nuance to this relationship. Both show a relatively horizontal line for White teachers, meaning that White teachers, no matter their original school race congruence levels, choose to work at destination schools with about 80% racially congruent colleagues. For Black teachers, there is a curved shape to the relationship between the original school's racially congruent colleagues and the destination school's racially congruent colleagues. This suggests that Black teachers prefer to work with some racially congruent colleagues but may find equilibrium at about 50%. While Panel B and Panel C both show a decline in higher original school proportions for Black teachers, sample sizes in these cells are quite low (i.e., 15 for 70% and 9 for 80%); therefore the apparent dip is likely driven by idiosyncratic spline sample differences rather than true differences.

Discussion

Using statewide administrative data and a series of fixed effects models, I show that larger proportions of racially congruent colleagues decreases the likelihood of teacher turnover, particularly for Black teachers. Specifically, I find that a 10 percentage point increase in teacher-colleague race congruence is associated with an overall 1.7% decrease in the likelihood of teacher turnover and that these effects are primarily driven by the experiences of Black teachers, as they appear to benefit significantly more from racially congruent colleagues than do White teachers. The overall effect size is small in magnitude at about 6% of a standard deviation but becomes larger for the effect on Black teachers, as the effect size is 9% of a standard deviation. In practice, this finding means that the demographic composition of teachers within a school does matter to teachers, and especially Black teachers.

While this is not the first study to examine the relationship between racially congruent colleagues and teacher mobility (e.g., Bruno et al., 2020; Rodriguez et al., 2022; Strunk & Robinson, 2006; Xu et al., 2024a), this study uniquely contributes to the first plausibly causal findings on turnover and the first findings that identify transfer preferences concerning racially congruent colleagues. The magnitude of change here appears to be aligned with similar recent work where Black teachers with 15% or fewer racially congruent colleagues are 4.3% more likely to turnover than those with more than 40% racially congruent colleagues (Xu et al., 2024). While not a perfect alignment due to the difference in operationalization of the race congruence variable, my estimate can extrapolated to see a 4.25% decrease in the likelihood of turnover for a 25 percentage point change in racially congruent colleagues.

I also extend this prior literature on teacher-colleague race congruence by examining transferring teachers' revealed preferences. On average, teachers transfer to schools with more

racially congruent colleagues but prefer schools with at least *some* racial diversity. That said, the finding for higher proportions of racially congruent colleagues should be interpreted cautiously due to the influence of ceiling effects.

White teachers appear to transfer to schools with about 80% racially congruent colleagues, regardless of racial congruence in their original schools. This is important for two reasons. First, as shown in the RQ1 and RQ2 findings above, White teachers do not appear to be as responsive to the proportion of racially congruent colleagues that they encounter. Second, White teachers, on average, do not choose to work with exclusively racially congruent colleagues but rather select into schools with at least *some* teacher diversity. Finally, Black teachers select into schools with more racially congruent colleagues when their original schools have low proportions of racially congruent colleagues but this plateaus around 50% for their destination schools.

In addition, these findings support the idea that teachers don't necessarily wish to work with exclusively the same race but prefer to work in a more racially diverse environment, agreeing with prior work on how race influences and benefits peer interactions (Billings et al., 2021; Carrell et al., 2019; Gershenson et al., 2023). It is important to interpret the findings from this study as a call for a more diverse workforce and not as a signal to only hire teachers of one race/ethnicity identity. Prior work calls for demographic parity between the student body and the teacher workforce (Jackson & Kohli, 2016; Villegas & Irvine, 2010), and this study reflects that same call. A diverse teacher workforce has particular benefits for all students (Blazar, 2024), and as this study and others (e.g., Bristol, 2018; Gershenson et al., 2023; Rodriguez et al., 2022) show, also for all teachers.

There are, however, some limitations to these findings. First, the Pennsylvania teacher workforce is predominantly White (i.e., about 96% in this dataset) with only a few pockets of schools with high proportions of Black teachers (i.e., Philadelphia, Pittsburgh). Future research would benefit from examining these questions in states with a larger population of Black teachers, though Pennsylvania is a useful context to investigate because it contains one of the largest public school systems in the country with unique needs for school improvement. Further, this study does not investigate how racially congruent colleagues might affect teachers of race/ethnicity identities other than Black and White due to restrictions based on sample sizes. Teachers of Asian, American Indian, Hispanic, multi-racial, or Native Hawaiian identities experience racialized systems differently than Black teachers (Bauman et al., 2014), so these findings should not be generalized to all teachers.

This analysis also does not unpack the mechanisms through which this effect of racially congruent colleagues might work. Survey measures on working conditions were not available for this analysis but finding mediators could be an important extension of the current study to more holistically understand why this relationship exists. Prior work has identified potential mechanisms, such as collaboration and reduced social isolation (Bristol, 2020; Kohli, 2018; Xu et al., 2024), that might mediate turnover decisions for teachers stemming from the proportion of racially congruent colleagues, but little large-scale quantitative research exists that investigates these mediators.

Finally, there are a few policy implications stemming from this analysis. Teachers of color are already severely underrepresented in the workforce so there is a need to diversify the teacher pipeline and attract more people of color to the profession (Bartanen & Kwok, 2022; Carter Andrews et al., 2019). There are also barriers to success for teachers of color even after

they enter the workforce and are hired in a school. Unsupportive school cultures can make teachers of color feel ostracized and "othered" (Amos, 2020; Bristol & Mentor, 2018; Fairchild et al., 2012), so school leaders should focus on culturally responsive practices (Ladson-Billings, 1995) to build a culture of equity within their schools.

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Tables

Table 1. Full and Analytic Sample Descriptive Statistics

	Full PA Teacher Sample	Analytic Sample			Transferring Teacher Sample ⁵
		Overall	Black Teachers	White Teachers	
<i>Panel A. Teacher Characteristics</i>					
Black	0.038 (0.191)	0.034 (0.180)	1.000 (0.000)	0.000 (0.000)	0.068 (0.252)
Hispanic	0.010 (0.099)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Asian, American Indian, Multi-Racial, and Native Hawaiian	0.010 (0.098)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
White	0.943 (0.233)	0.966 (0.180)	0.000 (0.000)	1.000 (0.000)	0.932 (0.252)
Male	0.260 (0.439)	0.264 (0.441)	0.211 (0.408)	0.266 (0.442)	0.232 (0.422)
Experience (Years)	13.8 (8.5)	14.5 (8.4)	15.3 (8.7)	14.5 (8.3)	10.8 (7.5)
Graduate Degree (Master's, doctorate, or specialist's)	0.562 (0.496)	0.577 (0.494)	0.277 (0.447)	0.587 (0.492)	0.485 (0.500)
<i>Panel B. Mobility Outcomes</i>					
Leave School for Any Pathway Out	0.098 (0.298)	0.080 (0.271)	0.147 (0.354)	0.077 (0.267)	1.000 (0.000)
Transfer Schools	0.052 (0.223)	0.048 (0.213)	0.098 (0.298)	0.046 (0.209)	1.000 (0.000)
Leave PA Data	0.046 (0.209)	0.032 (0.176)	0.049 (0.215)	0.032 (0.175)	0.000 (0.000)
<i>Panel C. Teacher Colleague Race/Ethnicity</i>					
Black Colleagues	0.038 (0.093)	0.032 (0.082)	0.242 (0.182)	0.025 (0.065)	0.064 (0.126)
Hispanic Colleagues	0.010 (0.028)	0.008 (0.019)	0.020 (0.032)	0.007 (0.018)	0.010 (0.026)
Asian, American Indian, Multi-Racial, and Native Hawaiian Colleagues	0.010 (0.022)	0.008 (0.018)	0.026 (0.033)	0.007 (0.017)	0.010 (0.021)
White Colleagues	0.942 (0.113)	0.952 (0.097)	0.712 (0.190)	0.961 (0.080)	0.917 (0.144)
Racially Congruent Colleagues	0.885 (0.201)	0.909 (0.155)	0.242 (0.182)	0.961 (0.080)	0.858 (0.204)
Racially Congruent Principal	0.813 (0.390)	0.862 (0.345)	0.493 (0.500)	0.874 (0.331)	0.793 (0.405)
<i>Panel D. School-Level Student Characteristics</i>					
Enrollment	889.7 (980.1)	805.6 (559.5)	748.2 (535.4)	807.6 (560.2)	668.0 (459.8)
Economically Disadvantaged	0.456 (0.308)	0.456 (0.293)	0.812 (0.295)	0.444 (0.286)	0.580 (0.320)
English learner	0.032 (0.059)	0.033 (0.058)	0.071 (0.088)	0.031 (0.056)	0.044 (0.068)
Special Education	0.153 (0.066)	0.159 (0.056)	0.170 (0.084)	0.158 (0.055)	0.165 (0.064)
Male	0.507 (0.070)	0.516 (0.032)	0.520 (0.052)	0.515 (0.031)	0.517 (0.043)
Black	0.145 (0.232)	0.121 (0.201)	0.528 (0.338)	0.107 (0.179)	0.207 (0.280)
Hispanic	0.107 (0.169)	0.101 (0.158)	0.149 (0.196)	0.099 (0.156)	0.125 (0.185)
Asian, American Indian, Multi-Racial, and Native Hawaiian	0.076 (0.071)	0.076 (0.069)	0.106 (0.093)	0.075 (0.068)	0.077 (0.070)
White	0.659 (0.316)	0.701 (0.287)	0.217 (0.275)	0.718 (0.272)	0.589 (0.349)
Observations	770,650	652,519	21,922	630,597	29,658

Note: Estimates represent means with standard deviations in parentheses.

⁵ The Transferring Teacher Sample is a restricted sub-sample that includes only those teachers who transfer in year *t*. Thus, I removed all teachers who either stayed in their schools or left the PA dataset from this sub-sample. All covariates presented in Column 5 are for the transferring teacher sample.

Table 2. Estimated effects of racially congruent colleagues on teacher turnover

	(1)	(2)	(3)	(4)
<i>Panel A. Any Leave</i>				
Race Congruence	-0.004*** (0.000)	-0.002*** (0.000)	-0.020*** (0.002)	-0.017*** (0.003)
Time-invariant teacher covariates	X	X		
Time-invariant school covariates	X		X	
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	652,519	652,519	652,519	652,519
R ²	0.020	0.065	0.266	0.312
Adj. R ²	0.020	0.061	0.117	0.169
Within R ²	0.020	0.009	0.025	0.026
<i>Panel B. Transfer</i>				
Race Congruence	-0.002*** (0.000)	-0.002*** (0.000)	-0.017*** (0.002)	-0.015*** (0.002)
Time-invariant teacher covariates	X	X		
Time-invariant school covariates	X		X	
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	652,519	652,519	652,519	652,519
R ²	0.026	0.093	0.253	0.324
Adj. R ²	0.026	0.089	0.102	0.183
Within R ²	0.026	0.010	0.023	0.005
<i>Panel C. Leave PA Data</i>				
Race Congruence	-0.001*** (0.000)	-0.001* (0.000)	-0.003* (0.001)	-0.002+ (0.001)
Time-invariant teacher covariates	X	X		
Time-invariant school covariates	X		X	
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	652,519	652,519	652,519	652,519
R ²	0.023	0.029	0.293	0.297
Adj. R ²	0.023	0.025	0.150	0.150
Within R ²	0.023	0.022	0.040	0.040

Note: Coefficients from Equation 1, predicting turnover as a function of race congruence and covariates. All models include time-varying teacher and school covariates. Teacher covariates are a non-linear function for teacher experience (i.e., 3 or less years, 4-10 years, 11-20 years, and more than 20 years), an indicator for whether the teacher has a graduate degree. School covariates include a logged function of enrollment, proportions of students of each race/ethnicity identity (i.e., Black, Hispanic, American Indian/Asian/multi-racial/Native Hawaiian, and White), proportion of economically disadvantaged students, proportion of male students, proportion of students identified for special education services, and proportion of English language learners. Time-invariant teacher characteristics include dichotomous indicators for male teachers and for Black teachers, respectively. Models predicting the likelihood of transfer also include, as a control, a dichotomous indicator for teacher-year observations that leave the PA dataset in order to maintain the reference category of remaining in a school. The race congruence variable is rescaled by a factor of 10, so coefficients can be interpreted as the change in the likelihood of turnover for a 10 percentage point increase in racially congruent colleagues. See Appendix Tables B1.1 and B1.2 for supplemental operationalizations. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

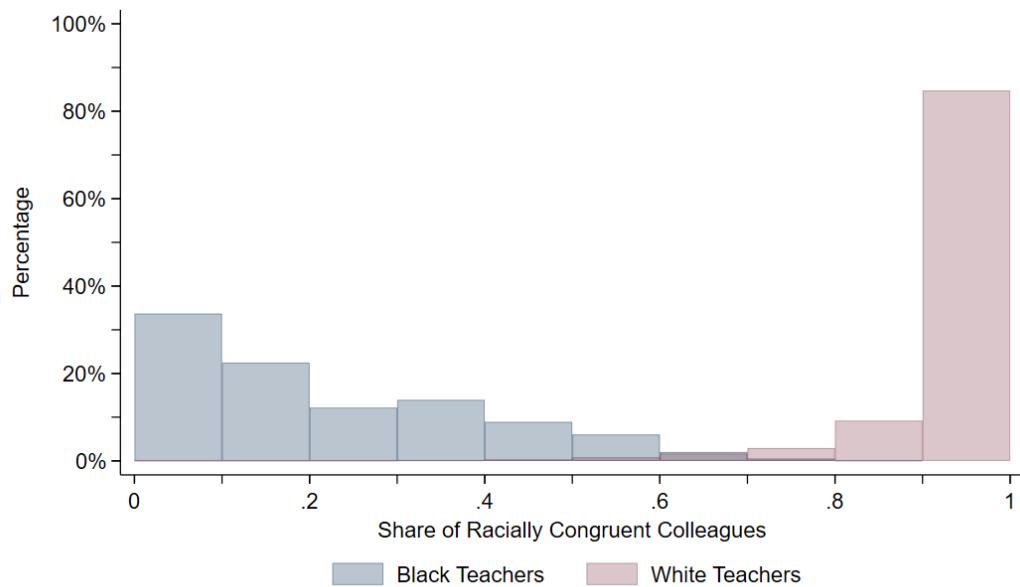
Table 3. Estimated effects of racially congruent colleagues on teacher turnover, by teacher race

	(1)	(2)	(3)	(4)
<i>Panel A. Any Leave</i>				
Black x Race Congruence	-0.002 (0.001)	-0.010*** (0.002)	-0.020*** (0.006)	-0.032*** (0.006)
White x Race Congruence	-0.003*** (0.000)	-0.003*** (0.000)	-0.020*** (0.003)	-0.010*** (0.003)
Time-invariant teacher covariates	X	X		
Time-invariant school covariates	X		X	
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	652,519	652,519	652,519	652,519
R ²	0.020	0.065	0.266	0.313
Adj. R ²	0.020	0.061	0.117	0.169
Within R ²	0.020	0.009	0.025	0.026
<i>Panel B. Transfer</i>				
Black x Race Congruence	-0.000 (0.001)	-0.006*** (0.001)	-0.021*** (0.005)	-0.034*** (0.005)
White x Race Congruence	-0.002*** (0.000)	-0.002*** (0.000)	-0.016*** (0.003)	-0.006* (0.002)
Time-invariant teacher covariates	X	X		
Time-invariant school covariates	X		X	
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	652,519	652,519	652,519	652,519
R ²	0.026	0.093	0.253	0.324
Adj. R ²	0.026	0.089	0.102	0.183
Within R ²	0.026	0.010	0.023	0.005
<i>Panel C. Leave PA Data</i>				
Black x Race Congruence	-0.002* (0.001)	-0.004*** (0.001)	0.001 (0.003)	0.002 (0.003)
White x Race Congruence	-0.001*** (0.000)	-0.001*** (0.000)	-0.004*** (0.001)	-0.004** (0.002)
Time-invariant teacher covariates	X	X		
Time-invariant school covariates	X		X	
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	652,519	652,519	652,519	652,519
R ²	0.023	0.029	0.293	0.297
Adj. R ²	0.023	0.025	0.150	0.150
Within R ²	0.023	0.023	0.040	0.040

Note: Coefficients from Equation 2, predicting turnover as a function of race congruence and covariates. All models include time-varying teacher and school covariates. Teacher covariates are a non-linear function for teacher experience (i.e., 3 or less years, 4-10 years, 11-20 years, and more than 20 years), an indicator for whether the teacher has a graduate degree. School covariates include a logged function of enrollment, proportions of students of each race/ethnicity identity (i.e., Black, Hispanic, American Indian/Asian/multi-racial/Native Hawaiian, and White), proportion of economically disadvantaged students, proportion of male students, proportion of students identified for special education services, and proportion of English language learners. Time-invariant teacher characteristics include dichotomous indicators for male teachers and for Black teachers, respectively. Models predicting the likelihood of transfer also include, as a control, a dichotomous indicator for teacher-year observations that leave the PA dataset in order to maintain the reference category of remaining in a school. The race congruence variable is rescaled by a factor of 10, so coefficients can be interpreted as the change in likelihood of turnover for a 10 percentage point increase in racially congruent colleagues. See Appendix Tables B2.1 and B2.2 for supplemental operationalizations and appendix C for separate models by race. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Figures

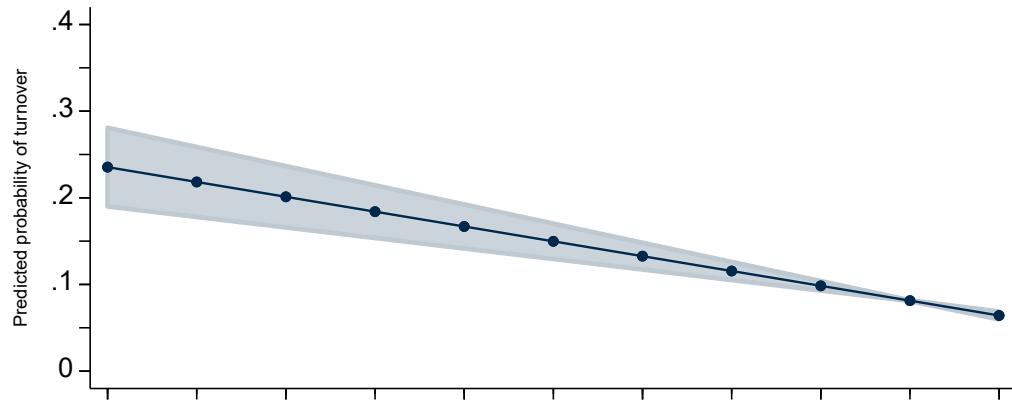
Figure 1. Kernel density plot of racially congruent colleagues for Black and White teachers



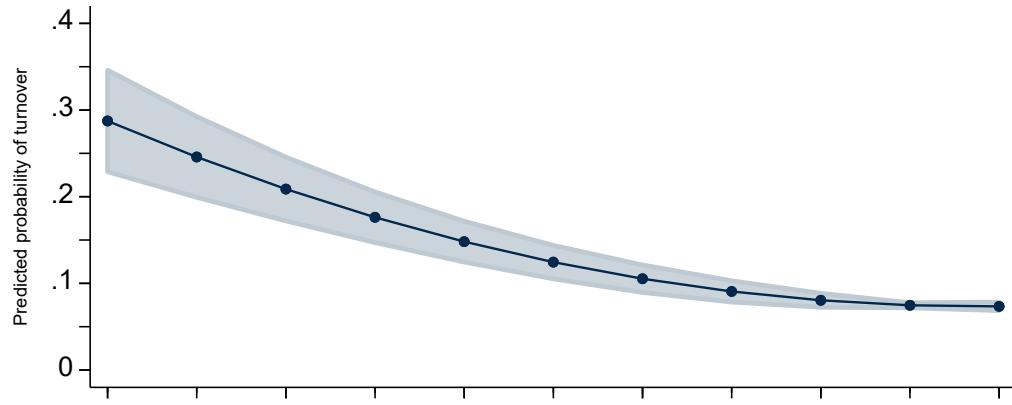
Note: Each bar height represents the percentage of Black or White teachers, respectively, that are within each bin of the share of racially congruent colleagues. No Black teachers in my sample have more than 80% racially congruent colleagues.

Figure 2. Marginal effects of colleague race congruence on teacher turnover

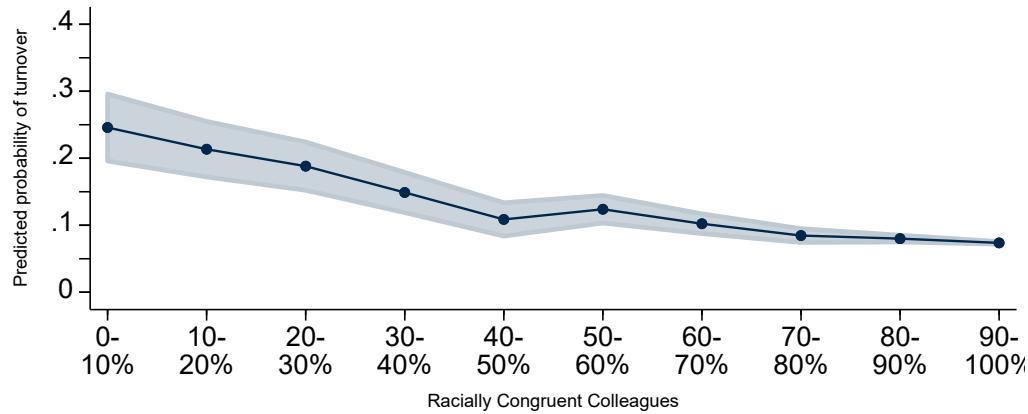
Panel A. Linear



Panel B. Quadratic



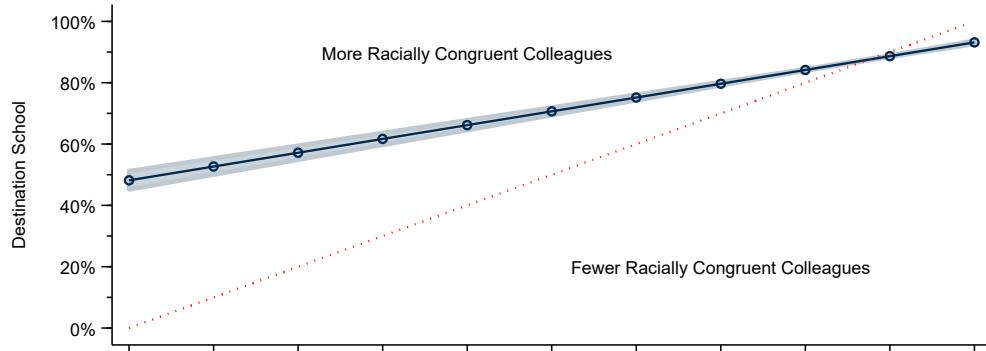
Panel C. Spline



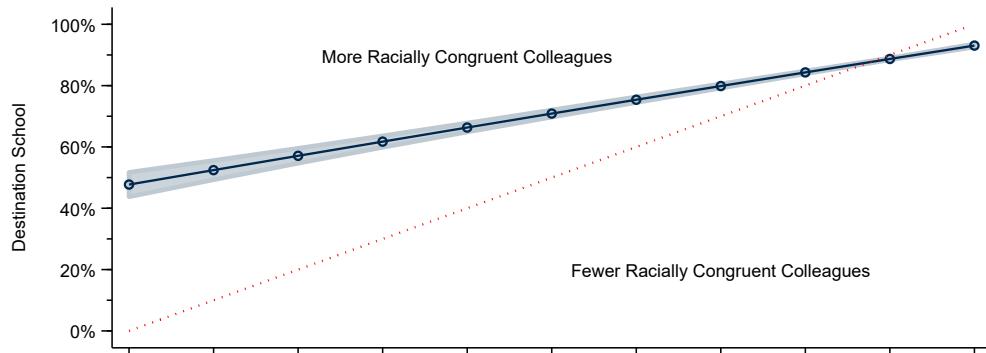
Note: This figure presents conditional marginal effects on any turnover for the linear, quadratic, and spline operationalization presented in Equation 2. See Appendix C for estimates separated by race. See Appendix D for analogous figures for transfer and leaving PA education outcomes.

Figure 3. Relationship between proportion of racially congruent colleagues in a transferring teacher's original school and their destination school

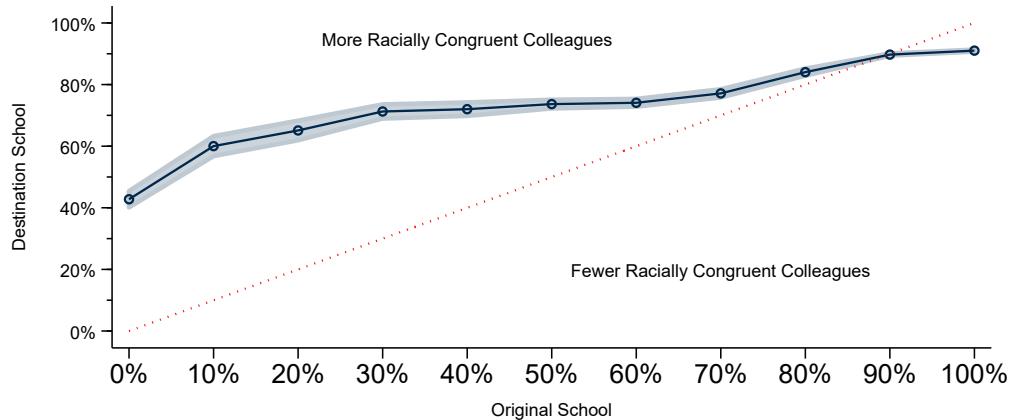
Panel A. Linear



Panel B. Quadratic



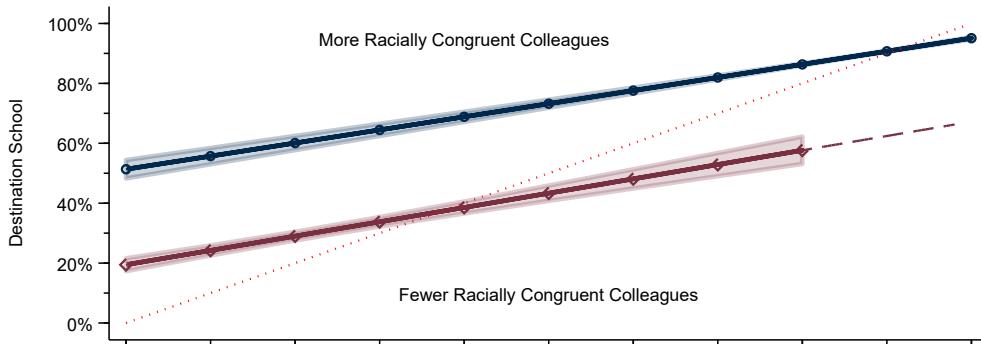
Panel C. Spline



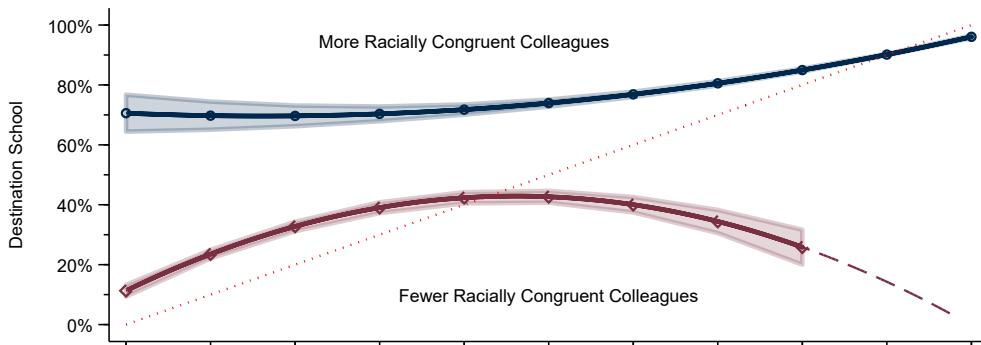
Note: This plot displays the marginal effects of a 10 percentage point increase in racially congruent colleagues at a transferring teacher's original school (i.e., t) on the share of racially congruent colleagues at their destination school (i.e., $t+1$). The diagonal red dotted line reflects an equivalence of racially congruent colleagues between the original school and destination school, meaning that if a teacher who falls on the red dotted line works with 30% racially congruent colleagues in their original school, they work with 30% racially congruent colleagues in their destination school. Those teachers who fall above the red dotted line transfer to a destination school with more racially congruent colleagues, and those who fall below the red dotted line transfer to a school with fewer racially congruent colleagues.

Figure 4. Relationship between proportion of racially congruent colleagues in a transferring teacher's original school and their destination school , by teacher race

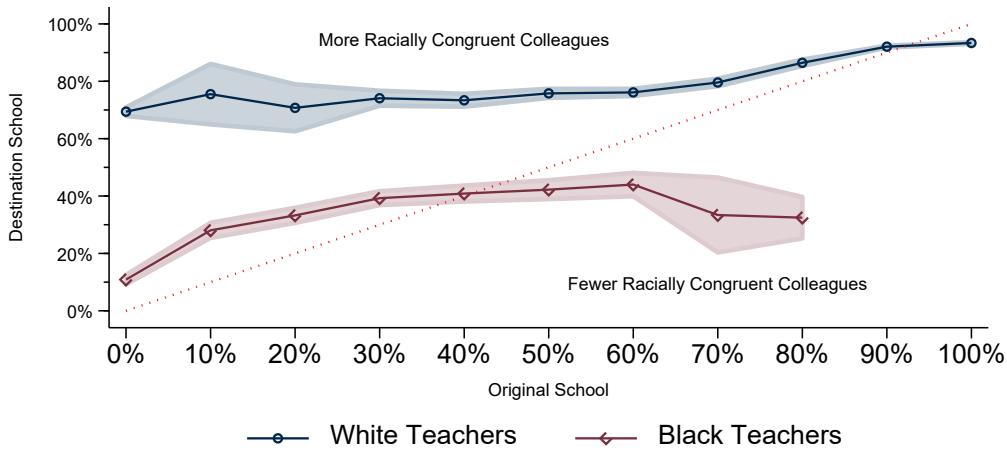
Panel A. Linear



Panel B. Quadratic



Panel C. Spline



Note: This plot displays the marginal effects of a 10 percentage point increase in racially congruent colleagues at a transferring teacher's original school (i.e., t) on the share of racially congruent colleagues at their destination school (i.e., $t+1$). The diagonal red dotted line reflects an equivalence of racially congruent colleagues between the original school and destination school, meaning that if a teacher who falls on the red dotted line works with 30% racially congruent colleagues in their original school, they work with 30% racially congruent colleagues in their destination school. Those teachers who fall above the red dotted line transfer to a destination school with more racially congruent colleagues, and those who fall below the red dotted line transfer to a school with fewer racially congruent colleagues. Black teachers do not experience greater than 80% racially congruent colleagues, in both this restricted sample and my full analytic sample, so I present marginal effects as solid lines with confidence intervals for within-sample predictions but I extend these trends with a dashed line for out-of-sample trends.

Appendix A: Robustness to Inclusion of Charter Schools

Appendix Table A1. Estimated effects of racially congruent colleagues on teacher turnover, including charter schools

	(1)	(2)	(3)	(4)
<i>Panel A. Any Leave</i>				
Race Congruence	-0.004*** (0.000)	-0.002*** (0.000)	-0.015*** (0.002)	-0.015*** (0.002)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	712,320	712,320	712,320	712,320
R ²	0.027	0.071	0.273	0.318
Adj. R ²	0.027	0.067	0.125	0.175
Within R ²	0.027	0.010	0.029	0.026
<i>Panel B. Transfer</i>				
Race Congruence	-0.002*** (0.000)	-0.002*** (0.000)	-0.012*** (0.002)	-0.012*** (0.002)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	712,320	712,320	712,320	712,320
R ²	0.030	0.095	0.259	0.327
Adj. R ²	0.030	0.091	0.107	0.184
Within R ²	0.030	0.011	0.030	0.006
<i>Panel C. Leave PA Data</i>				
Race Congruence	-0.002*** (0.000)	-0.001*** (0.000)	-0.003** (0.001)	-0.003** (0.001)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	712,320	712,320	712,320	712,320
R ²	0.023	0.030	0.299	0.303
Adj. R ²	0.023	0.025	0.156	0.156
Within R ²	0.023	0.021	0.041	0.040

Note: Coefficients from Equation 1 (related to main Table 2), predicting turnover as a function of race congruence and covariates, including teachers who work in charter schools in year t . Every model includes time-varying teacher and school covariates, such as teacher experience, graduate degree indicator, logged enrollment, proportions of students of each race/ethnicity identity, proportion of economically disadvantaged students, proportion of male students, proportion of students identified for special education services, and proportions of English language learners. Models predicting the likelihood of transfer also include, as a control, a dichotomous indicator for teacher-year observations that leave the PA dataset in order to maintain the reference category of remaining in a school. The race congruence variable is rescaled by a factor of 10, so coefficients can be interpreted as the change in likelihood of turnover for a 10 percentage point increase in racially congruent colleagues. * p<0.1, ** p<0.05, *** p<0.01

Appendix Table A2. Estimated effects of racially congruent colleagues on teacher turnover, by teacher race and including charter schools

	(1)	(2)	(3)	(4)
<i>Panel A. Any Leave</i>				
Black x Race Congruence	0.004** (0.001)	-0.013*** (0.002)	-0.005 (0.004)	-0.016*** (0.005)
White x Race Congruence	-0.007*** (0.001)	-0.000 (0.001)	-0.018*** (0.002)	-0.014*** (0.002)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	712,320	712,320	712,320	712,320
R ²	0.027	0.071	0.271	0.318
Adj. R ²	0.027	0.067	0.122	0.175
Within R ²	0.027	0.011	0.026	0.026
<i>Panel B. Transfer</i>				
Black x Race Congruence	0.003** (0.001)	-0.010*** (0.002)	-0.010* (0.004)	-0.023*** (0.004)
White x Race Congruence	-0.002*** (0.000)	0.002*** (0.001)	-0.012*** (0.002)	-0.006** (0.002)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	712,320	712,320	712,320	712,320
R ²	0.030	0.095	0.256	0.327
Adj. R ²	0.030	0.091	0.104	0.184
Within R ²	0.030	0.012	0.027	0.006
<i>Panel C. Leave PA Data</i>				
Black x Race Congruence	0.001 (0.001)	-0.003** (0.001)	0.005** (0.002)	0.007** (0.002)
White x Race Congruence	-0.005*** (0.000)	-0.002*** (0.001)	-0.006*** (0.001)	-0.008*** (0.001)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	712,320	712,320	712,320	712,320
R ²	0.023	0.030	0.299	0.303
Adj. R ²	0.023	0.025	0.156	0.156
Within R ²	0.023	0.021	0.041	0.041

Note: Coefficients from Equation 2 (related to main Table 3), predicting turnover as a function of race congruence and covariates, including teachers who work in charter school in year t . Every model includes time-varying teacher and school covariates, such as teacher experience, graduate degree indicator, logged enrollment, proportions of students of each race/ethnicity identity, the proportion of economically disadvantaged students, the proportion of male students, the proportion of students identified for special education services, and proportions of English language learners. Models predicting the likelihood of transfer also include, as a control, a dichotomous indicator for teacher-year observations that leave the PA dataset in order to maintain the reference category of remaining in a school. The race congruence variable in the regression is a re-scaled version of the proportion of racially congruent colleagues for ease of interpretation. It was rescaled by a factor of 10, so coefficients should be interpreted as the change in likelihood of turnover for a 10 pp increase in racially congruent colleagues. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Appendix B: Supplemental Operationalizations

Appendix B1. Overall effects, analogous to research question 1

Appendix Table B1.1. Estimated effects of racially congruent colleagues on teacher turnover, quadratic function

	(1)	(2)	(3)	(4)
<i>Panel A. Any Leave</i>				
Race Congruence	0.001 (0.002)	-0.020*** (0.004)	-0.029*** (0.008)	-0.044*** (0.008)
Race Congruence ²	-0.001*** (0.000)	0.001*** (0.000)	0.001 (0.001)	0.002*** (0.001)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	652,519	652,519	652,519	652,519
R ²	0.020	0.065	0.266	0.313
Adj. R ²	0.020	0.061	0.117	0.169
Within R ²	0.020	0.009	0.025	0.027
<i>Panel B. Transfer</i>				
Race Congruence	0.002 (0.002)	-0.012*** (0.003)	-0.021** (0.007)	-0.036*** (0.007)
Race Congruence ²	-0.000*** (0.000)	0.001** (0.000)	0.000 (0.001)	0.002*** (0.000)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	652,519	652,519	652,519	652,519
R ²	0.026	0.093	0.253	0.324
Adj. R ²	0.026	0.089	0.102	0.183
Within R ²	0.026	0.010	0.023	0.005
<i>Panel C. Leave PA Data</i>				
Race Congruence	-0.001 (0.001)	-0.008*** (0.002)	-0.008* (0.004)	-0.008* (0.004)
Race Congruence ²	-0.000 (0.000)	0.001** (0.000)	0.000 (0.000)	0.000+ (0.000)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	652,519	652,519	652,519	652,519
R ²	0.024	0.029	0.293	0.297
Adj. R ²	0.023	0.025	0.150	0.150
Within R ²	0.024	0.023	0.040	0.040

Note: Coefficients from Equation 2, predicting turnover as a quadratic function of race congruence and covariates. Every model includes time-varying teacher and school covariates, such as teacher experience, graduate degree indicator, logged enrollment, proportions of students of each race/ethnicity identity, proportion of economically disadvantaged students, proportion of male students, proportion of students identified for special education services, and proportions of English language learners. Models predicting the likelihood of transfer also include, as a control, a dichotomous indicator for teacher-year observations that leave the PA dataset in order to maintain the reference category of remaining in a school. The race congruence variable is rescaled by a factor of 10, so coefficients can be interpreted as the change in likelihood of turnover for a 10 percentage point increase in racially congruent colleagues. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Appendix Table B1.2a. Estimated effects of racially congruent colleagues on any teacher turnover, non-parametric spline function

	(1)	(2)	(3)	(4)
Any Leave				
0-10% (refcat)				
11-20%	-0.002 (0.007)	-0.009 (0.008)	-0.030+ (0.016)	-0.032* (0.016)
21-30%	0.018* (0.009)	-0.008 (0.011)	-0.048* (0.020)	-0.058** (0.020)
31-40%	0.026** (0.008)	-0.020+ (0.012)	-0.065** (0.022)	-0.097*** (0.023)
41-50%	0.015+ (0.009)	-0.047*** (0.013)	-0.106*** (0.024)	-0.137*** (0.024)
51-60%	0.007 (0.009)	-0.040** (0.012)	-0.100*** (0.025)	-0.122*** (0.025)
61-70%	-0.021* (0.009)	-0.046*** (0.011)	-0.136*** (0.025)	-0.144*** (0.025)
71-80%	-0.046*** (0.009)	-0.058*** (0.010)	-0.157*** (0.026)	-0.161*** (0.026)
81-90%	-0.043*** (0.008)	-0.055*** (0.009)	-0.167*** (0.026)	-0.166*** (0.026)
91-100%	-0.045*** (0.008)	-0.057*** (0.009)	-0.174*** (0.026)	-0.172*** (0.026)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	652,519	652,519	652,519	652,519
R ²	0.020	0.065	0.266	0.313
Adj. R ²	0.020	0.061	0.117	0.169
Within R ²	0.020	0.009	0.025	0.027

Note: Coefficients from Equation 2, predicting turnover as a non-parametric function of race congruence and covariates. Every model includes time-varying teacher and school covariates, such as teacher experience, graduate degree indicator, logged enrollment, proportions of students of each race/ethnicity identity, proportion of economically disadvantaged students, proportion of male students, proportion of students identified for special education services, and proportions of English language learners. Models predicting the likelihood of transfer also include, as a control, a dichotomous indicator for teacher-year observations that leave the PA dataset in order to maintain the reference category of remaining in a school. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Appendix Table B1.2b. Estimated effects of racially congruent colleagues on teacher transfer, non-parametric spline function

	(1)	(2)	(3)	(4)
<i>Transfer</i>				
0-10% (refcat)	---	---	---	---
11-20%	-0.004 (0.005)	-0.005 (0.006)	-0.015 (0.014)	-0.017 (0.014)
21-30%	0.018* (0.008)	0.004 (0.009)	-0.022 (0.018)	-0.030+ (0.018)
31-40%	0.025*** (0.007)	-0.005 (0.010)	-0.037+ (0.020)	-0.067** (0.020)
41-50%	0.011 (0.007)	-0.030** (0.011)	-0.075*** (0.022)	-0.104*** (0.022)
51-60%	0.013+ (0.008)	-0.017 (0.011)	-0.068** (0.023)	-0.089*** (0.023)
61-70%	-0.006 (0.008)	-0.018* (0.009)	-0.096*** (0.024)	-0.105*** (0.023)
71-80%	-0.031*** (0.007)	-0.036*** (0.008)	-0.120*** (0.024)	-0.127*** (0.024)
81-90%	-0.022** (0.007)	-0.031*** (0.008)	-0.128*** (0.024)	-0.131*** (0.024)
91-100%	-0.025*** (0.007)	-0.034*** (0.008)	-0.135*** (0.024)	-0.138*** (0.024)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	652,519	652,519	652,519	652,519
R ²	0.027	0.093	0.253	0.324
Adj. R ²	0.027	0.089	0.102	0.183
Within R ²	0.027	0.011	0.023	0.005

Note: Coefficients from Equation 2, predicting turnover as a non-parametric function of race congruence and covariates. Every model includes time-varying teacher and school covariates, such as teacher experience, graduate degree indicator, logged enrollment, proportions of students of each race/ethnicity identity, proportion of economically disadvantaged students, proportion of male students, proportion of students identified for special education services, and proportions of English language learners. Models predicting the likelihood of transfer also include, as a control, a dichotomous indicator for teacher-year observations that leave the PA dataset in order to maintain the reference category of remaining in a school. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Appendix Table B1.2c. Estimated effects of racially congruent colleagues on leaving PA education, non-parametric spline function

	(1)	(2)	(3)	(4)
<i>Leave PA Data</i>				
0-10% (refcat)	---	---	---	---
11-20%	0.002 (0.004)	-0.004 (0.005)	-0.016+ (0.009)	-0.017+ (0.009)
21-30%	0.000 (0.005)	-0.013* (0.006)	-0.028** (0.010)	-0.029** (0.011)
31-40%	0.001 (0.004)	-0.016* (0.007)	-0.029** (0.011)	-0.032** (0.012)
41-50%	0.004 (0.005)	-0.018* (0.008)	-0.032** (0.012)	-0.035** (0.013)
51-60%	-0.007 (0.005)	-0.025*** (0.007)	-0.033** (0.012)	-0.034** (0.013)
61-70%	-0.015** (0.005)	-0.029*** (0.006)	-0.041*** (0.012)	-0.041** (0.013)
71-80%	-0.016** (0.005)	-0.024*** (0.006)	-0.039** (0.013)	-0.036** (0.013)
81-90%	-0.021*** (0.005)	-0.026*** (0.005)	-0.042** (0.013)	-0.037** (0.013)
91-100%	-0.021*** (0.005)	-0.024*** (0.005)	-0.041** (0.013)	-0.036** (0.013)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	652,519	652,519	652,519	652,519
R ²	0.024	0.029	0.293	0.297
Adj. R ²	0.024	0.025	0.150	0.150
Within R ²	0.024	0.023	0.041	0.040

Note: Coefficients from Equation 2, predicting turnover as a non-parametric function of race congruence and covariates. Every model includes time-varying teacher and school covariates, such as teacher experience, graduate degree indicator, logged enrollment, proportions of students of each race/ethnicity identity, proportion of economically disadvantaged students, proportion of male students, proportion of students identified for special education services, and proportions of English language learners. Models predicting the likelihood of transfer also include, as a control, a dichotomous indicator for teacher-year observations that leave the PA dataset in order to maintain the reference category of remaining in a school. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Appendix B2. Heterogeneity across racial identities, analogous to research question 2

Appendix Table B2.1. Estimated effects of racially congruent colleagues on teacher turnover, quadratic function

	(1)	(2)	(3)	(4)
<i>Panel A. Any Leave</i>				
Black x Race Congruence	0.006 (0.005)	-0.009 (0.006)	-0.043** (0.014)	-0.063*** (0.014)
(Black x Race Congruence) ²	-0.000 (0.001)	-0.002 (0.001)	0.003+ (0.002)	0.005* (0.002)
White x Race Congruence	-0.050*** (0.006)	-0.002 (0.012)	-0.036** (0.013)	-0.029* (0.014)
(White x Race Congruence) ²	0.003*** (0.000)	0.000 (0.001)	0.001 (0.001)	0.001 (0.001)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	652,519	652,519	652,519	652,519
R ²	0.020	0.065	0.266	0.313
Adj. R ²	0.020	0.061	0.117	0.169
Within R ²	0.020	0.009	0.025	0.027
<i>Panel B. Transfer</i>				
Black x Race Congruence	0.006 (0.004)	-0.003 (0.005)	-0.026+ (0.013)	-0.046*** (0.013)
(Black x Race Congruence) ²	-0.000 (0.001)	-0.002* (0.001)	0.001 (0.002)	0.002 (0.002)
White x Race Congruence	-0.030*** (0.005)	0.023* (0.010)	-0.014 (0.013)	-0.001 (0.013)
(White x Race Congruence) ²	0.002*** (0.000)	-0.001+ (0.001)	-0.000 (0.001)	-0.000 (0.001)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	652,519	652,519	652,519	652,519
R ²	0.026	0.093	0.253	0.324
Adj. R ²	0.026	0.089	0.102	0.183
Within R ²	0.026	0.011	0.023	0.005
<i>Panel C. Leave PA Data</i>				
Black x Race Congruence	0.000 (0.003)	-0.006 (0.004)	-0.018** (0.007)	-0.017* (0.007)
(Black x Race Congruence) ²	0.000 (0.000)	0.001 (0.001)	0.003** (0.001)	0.003** (0.001)
White x Race Congruence	-0.020*** (0.003)	-0.025*** (0.007)	-0.023** (0.007)	-0.030*** (0.009)
(White x Race Congruence) ²	0.001*** (0.000)	0.002*** (0.000)	0.001** (0.000)	0.002** (0.001)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	652,519	652,519	652,519	652,519
R ²	0.024	0.029	0.293	0.297
Adj. R ²	0.024	0.025	0.150	0.150
Within R ²	0.024	0.023	0.041	0.040

Note: Coefficients from Equation 2, predicting turnover as a quadratic function of race congruence and covariates. Every model includes time-varying teacher and school covariates, such as teacher experience, graduate degree indicator, logged enrollment, proportions of students of each race/ethnicity identity, proportion of economically disadvantaged students, proportion of male students, proportion of students identified for special education services, and proportions of English language learners. Models predicting the likelihood of transfer also include, as a control, a dichotomous indicator for teacher-year observations that leave the PA dataset in order to maintain the reference category of remaining in a school. The race congruence variable is rescaled by a factor of 10, so coefficients can be interpreted as the change in likelihood of turnover for a 10 percentage point increase in racially congruent colleagues. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Appendix Table B2.2a. Estimated effects of racially congruent colleagues on any teacher turnover, non-parametric spline function

	(1)	(2)	(3)	(4)
<i>Any Leave</i>				
0-10% (refcat)	---	---	---	---
11-20%	-0.002 (0.007)	-0.009 (0.008)	-0.030+ (0.016)	-0.032* (0.016)
21-30%	0.018* (0.009)	-0.008 (0.011)	-0.048* (0.020)	-0.058** (0.020)
31-40%	0.026** (0.008)	-0.020+ (0.012)	-0.065** (0.022)	-0.097*** (0.023)
41-50%	0.015+ (0.009)	-0.047*** (0.013)	-0.106*** (0.024)	-0.137*** (0.024)
51-60%	0.007 (0.009)	-0.040** (0.012)	-0.100*** (0.025)	-0.122*** (0.025)
61-70%	-0.021* (0.009)	-0.046*** (0.011)	-0.136*** (0.025)	-0.144*** (0.025)
71-80%	-0.046*** (0.009)	-0.058*** (0.010)	-0.157*** (0.026)	-0.161*** (0.026)
81-90%	-0.043*** (0.008)	-0.055*** (0.009)	-0.167*** (0.026)	-0.166*** (0.026)
91-100%	-0.045*** (0.008)	-0.057*** (0.009)	-0.174*** (0.026)	-0.172*** (0.026)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	652,519	652,519	652,519	652,519
R ²	0.020	0.065	0.266	0.313
Adj. R ²	0.020	0.061	0.117	0.169
Within R ²	0.020	0.009	0.025	0.027

Note: Coefficients from Equation 2, predicting turnover as a non-parametric function of race congruence and covariates. Every model includes time-varying teacher and school covariates, such as teacher experience, graduate degree indicator, logged enrollment, proportions of students of each race/ethnicity identity, proportion of economically disadvantaged students, proportion of male students, proportion of students identified for special education services, and proportions of English language learners. Models predicting the likelihood of transfer also include, as a control, a dichotomous indicator for teacher-year observations that leave the PA dataset in order to maintain the reference category of remaining in a school. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Appendix Table B2.2b. Estimated effects of racially congruent colleagues on teacher transfer, non-parametric spline function

	(1)	(2)	(3)	(4)
<i>Transfer</i>				
0-10% (refcat)	---	---	---	---
11-20%	-0.004 (0.005)	-0.005 (0.006)	-0.015 (0.014)	-0.017 (0.014)
21-30%	0.018* (0.008)	0.004 (0.009)	-0.022 (0.018)	-0.030+ (0.018)
31-40%	0.025*** (0.007)	-0.005 (0.010)	-0.037+ (0.020)	-0.067** (0.020)
41-50%	0.011 (0.007)	-0.030** (0.011)	-0.075*** (0.022)	-0.104*** (0.022)
51-60%	0.013+ (0.008)	-0.017 (0.011)	-0.068** (0.023)	-0.089*** (0.023)
61-70%	-0.006 (0.008)	-0.018* (0.009)	-0.096*** (0.024)	-0.105*** (0.023)
71-80%	-0.031*** (0.007)	-0.036*** (0.008)	-0.120*** (0.024)	-0.127*** (0.024)
81-90%	-0.022** (0.007)	-0.031*** (0.008)	-0.128*** (0.024)	-0.131*** (0.024)
91-100%	-0.025*** (0.007)	-0.034*** (0.008)	-0.135*** (0.024)	-0.138*** (0.024)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	652,519	652,519	652,519	652,519
R ²	0.027	0.093	0.253	0.324
Adj. R ²	0.027	0.089	0.102	0.183
Within R ²	0.027	0.011	0.023	0.005

Note: Coefficients from Equation 2, predicting turnover as a non-parametric function of race congruence and covariates. Every model includes time-varying teacher and school covariates, such as teacher experience, graduate degree indicator, logged enrollment, proportions of students of each race/ethnicity identity, proportion of economically disadvantaged students, proportion of male students, proportion of students identified for special education services, and proportions of English language learners. Models predicting the likelihood of transfer also include, as a control, a dichotomous indicator for teacher-year observations that leave the PA dataset in order to maintain the reference category of remaining in a school. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Appendix Table B2.2c. Estimated effects of racially congruent colleagues on leaving PA education, non-parametric spline function

	(1)	(2)	(3)	(4)
<i>Leave PA Data</i>				
0-10% (refcat)	---	---	---	---
11-20%	0.002 (0.004)	-0.004 (0.005)	-0.016+ (0.009)	-0.017+ (0.009)
21-30%	0.000 (0.005)	-0.013* (0.006)	-0.028** (0.010)	-0.029** (0.011)
31-40%	0.001 (0.004)	-0.016* (0.007)	-0.029** (0.011)	-0.032** (0.012)
41-50%	0.004 (0.005)	-0.018* (0.008)	-0.032** (0.012)	-0.035** (0.013)
51-60%	-0.007 (0.005)	-0.025*** (0.007)	-0.033** (0.012)	-0.034** (0.013)
61-70%	-0.015** (0.005)	-0.029*** (0.006)	-0.041*** (0.012)	-0.041** (0.013)
71-80%	-0.016** (0.005)	-0.024*** (0.006)	-0.039** (0.013)	-0.036** (0.013)
81-90%	-0.021*** (0.005)	-0.026*** (0.005)	-0.042** (0.013)	-0.037** (0.013)
91-100%	-0.021*** (0.005)	-0.024*** (0.005)	-0.041** (0.013)	-0.036** (0.013)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	652,519	652,519	652,519	652,519
R ²	0.024	0.029	0.293	0.297
Adj. R ²	0.024	0.025	0.150	0.150
Within R ²	0.024	0.023	0.041	0.040

Note: Coefficients from Equation 2, predicting turnover as a non-parametric function of race congruence and covariates. Every model includes time-varying teacher and school covariates, such as teacher experience, graduate degree indicator, logged enrollment, proportions of students of each race/ethnicity identity, proportion of economically disadvantaged students, proportion of male students, proportion of students identified for special education services, and proportions of English language learners. Models predicting the likelihood of transfer also include, as a control, a dichotomous indicator for teacher-year observations that leave the PA dataset in order to maintain the reference category of remaining in a school. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Appendix C: Analyses Separated by Race

Appendix C1. Linear Operationalization of Race Congruence Predictor

Appendix Table C1.1. Estimated effects of racially congruent colleagues on teacher turnover for any pathway out

	(1)	(2)	(3)	(4)
<i>Panel A. Black Teachers</i>				
Race Congruence	0.008** (0.003)	0.047*** (0.006)	-0.003 (0.006)	0.001 (0.007)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	21,922	21,922	21,922	21,922
R ²	0.027	0.071	0.271	0.318
Adj. R ²	0.027	0.067	0.122	0.175
Within R ²	0.027	0.011	0.026	0.026
<i>Panel B. White Teachers</i>				
Race Congruence	0.001 (0.001)	-0.003** (0.001)	0.005** (0.002)	0.007** (0.002)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	630,597	630,597	630,597	630,597
R ²	0.023	0.030	0.299	0.303
Adj. R ²	0.023	0.025	0.156	0.156
Within R ²	0.023	0.021	0.041	0.041

Note: Coefficients from Equation 1, predicting turnover as a function of race congruence and covariates but ran separately for Black teachers and White teachers. Every model includes time-varying teacher and school covariates, such as teacher experience, graduate degree indicator, logged enrollment, proportions of students of each race/ethnicity identity, proportion of economically disadvantaged students, proportion of male students, proportion of students identified for special education services, and proportions of English language learners. Models predicting the likelihood of transfer also include, as a control, a dichotomous indicator for teacher-year observations that leave the PA dataset in order to maintain the reference category of remaining in a school. The race congruence variable is rescaled by a factor of 10, so coefficients can be interpreted as the change in likelihood of turnover for a 10 percentage point increase in racially congruent colleagues. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Appendix Table C1.2. Estimated effects of racially congruent colleagues on teacher transfer

	(1)	(2)	(3)	(4)
<i>Panel A. Black Teachers</i>				
Race Congruence	0.006** (0.002)	0.031*** (0.005)	-0.005 (0.006)	0.000 (0.006)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	21,922	21,922	21,922	21,922
R ²	0.027	0.071	0.271	0.318
Adj. R ²	0.027	0.067	0.122	0.175
Within R ²	0.027	0.011	0.026	0.026
<i>Panel B. White Teachers</i>				
Race Congruence	-0.006*** (0.001)	0.019*** (0.002)	-0.013*** (0.003)	0.002 (0.002)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	630,597	630,597	630,597	630,597
R ²	0.023	0.030	0.299	0.303
Adj. R ²	0.023	0.025	0.156	0.156
Within R ²	0.023	0.021	0.041	0.041

Note: Coefficients from Equation 1, predicting turnover as a function of race congruence and covariates but ran separately for Black teachers and White teachers. Every model includes time-varying teacher and school covariates, such as teacher experience, graduate degree indicator, logged enrollment, proportions of students of each race/ethnicity identity, proportion of economically disadvantaged students, proportion of male students, proportion of students identified for special education services, and proportions of English language learners. Models predicting the likelihood of transfer also include, as a control, a dichotomous indicator for teacher-year observations that leave the PA dataset in order to maintain the reference category of remaining in a school. The race congruence variable is rescaled by a factor of 10, so coefficients can be interpreted as the change in the likelihood of turnover for a 10 percentage point increase in racially congruent colleagues. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Appendix Table C1.3. Estimated effects of racially congruent colleagues on leaving PA education

	(1)	(2)	(3)	(4)
<i>Panel A. Black Teachers</i>				
Race Congruence	0.002 (0.002)	0.017*** (0.004)	0.002 (0.003)	0.001 (0.004)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	21,922	21,922	21,922	21,922
R ²	0.031	0.073	0.315	0.335
Adj. R ²	0.029	0.032	0.159	0.139
Within R ²	0.031	0.028	0.060	0.059
<i>Panel B. White Teachers</i>				
Race Congruence	-0.004*** (0.001)	0.004* (0.002)	-0.004** (0.001)	-0.004* (0.002)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	630,597	630,597	630,597	630,597
R ²	0.023	0.030	0.299	0.303
Adj. R ²	0.023	0.025	0.156	0.156
Within R ²	0.023	0.021	0.041	0.041

Note: Coefficients from Equation 1, predicting turnover as a function of race congruence and covariates but ran separately for Black teachers and White teachers. Every model includes time-varying teacher and school covariates, such as teacher experience, graduate degree indicator, logged enrollment, proportions of students of each race/ethnicity identity, proportion of economically disadvantaged students, proportion of male students, proportion of students identified for special education services, and proportions of English language learners. Models predicting the likelihood of transfer also include, as a control, a dichotomous indicator for teacher-year observations that leave the PA dataset in order to maintain the reference category of remaining in a school. The race congruence variable is rescaled by a factor of 10, so coefficients can be interpreted as the change in likelihood of turnover for a 10 percentage point increase in racially congruent colleagues. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Appendix C2. Quadratic Operationalization of Race Congruence Predictor

Appendix Table C2.1. Estimated effects of racially congruent colleagues on teacher turnover for any pathway out

	(1)	(2)	(3)	(4)
<i>Panel A. Black Teachers</i>				
Race Congruence	0.008 (0.007)	0.115*** (0.015)	-0.013 (0.015)	-0.003 (0.016)
Race Congruence ²	0.000 (0.001)	-0.010*** (0.002)	0.001 (0.002)	0.001 (0.002)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	21,922	21,922	21,922	21,922
R ²	0.024	0.094	0.312	0.388
Adj. R ²	0.022	0.053	0.155	0.208
Within R ²	0.024	0.014	0.027	0.046
<i>Panel B. White Teachers</i>				
Race Congruence	-0.049*** (0.006)	0.061*** (0.014)	-0.031* (0.013)	0.004 (0.014)
Race Congruence ²	0.003*** (0.000)	-0.003** (0.001)	0.001 (0.001)	-0.000 (0.001)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	630,597	630,597	630,597	630,597
R ²	0.018	0.065	0.262	0.311
Adj. R ²	0.018	0.060	0.113	0.167
Within R ²	0.018	0.009	0.026	0.027

Note: Coefficients from Equation 1, predicting turnover as a function of race congruence and covariates but ran separately for Black teachers and White teachers. Every model includes time-varying teacher and school covariates, such as teacher experience, graduate degree indicator, logged enrollment, proportions of students of each race/ethnicity identity, proportion of economically disadvantaged students, proportion of male students, proportion of students identified for special education services, and proportions of English language learners. Models predicting the likelihood of transfer also include, as a control, a dichotomous indicator for teacher-year observations that leave the PA dataset in order to maintain the reference category of remaining in a school. The race congruence variable is rescaled by a factor of 10, so coefficients can be interpreted as the change in likelihood of turnover for a 10 percentage point increase in racially congruent colleagues. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Appendix Table C2.2. Estimated effects of racially congruent colleagues on teacher transfer

	(1)	(2)	(3)	(4)
<i>Panel A. Black Teachers</i>				
Race Congruence	0.008 (0.006)	0.085*** (0.013)	-0.006 (0.014)	0.004 (0.013)
Race Congruence ²	-0.000 (0.001)	-0.007*** (0.002)	0.000 (0.002)	-0.001 (0.002)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	21,922	21,922	21,922	21,922
R ²	0.035	0.106	0.309	0.408
Adj. R ²	0.034	0.066	0.152	0.235
Within R ²	0.035	0.022	0.030	0.022
<i>Panel B. White Teachers</i>				
Race Congruence	-0.031*** (0.005)	0.073*** (0.013)	-0.010 (0.013)	0.034** (0.013)
Race Congruence ²	0.002*** (0.000)	-0.004*** (0.001)	-0.000 (0.001)	-0.002** (0.001)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	630,597	630,597	630,597	630,597
R ²	0.018	0.065	0.262	0.311
Adj. R ²	0.018	0.060	0.113	0.167
Within R ²	0.018	0.009	0.026	0.027

Note: Coefficients from Equation 1, predicting turnover as a function of race congruence and covariates but ran separately for Black teachers and White teachers. Every model includes time-varying teacher and school covariates, such as teacher experience, graduate degree indicator, logged enrollment, proportions of students of each race/ethnicity identity, proportion of economically disadvantaged students, proportion of male students, proportion of students identified for special education services, and proportions of English language learners. Models predicting the likelihood of transfer also include, as a control, a dichotomous indicator for teacher-year observations that leave the PA dataset in order to maintain the reference category of remaining in a school. The race congruence variable is rescaled by a factor of 10, so coefficients can be interpreted as the change in the likelihood of turnover for a 10 percentage point increase in racially congruent colleagues. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Appendix Table C2.3. Estimated effects of racially congruent colleagues on leaving PA education

	(1)	(2)	(3)	(4)
<i>Panel A. Black Teachers</i>				
Race Congruence	0.000 (0.004)	0.034*** (0.009)	-0.008 (0.008)	-0.009 (0.010)
Race Congruence ²	0.000 (0.001)	-0.002* (0.001)	0.001 (0.001)	0.001 (0.001)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	21,922	21,922	21,922	21,922
R ²	0.031	0.074	0.315	0.335
Adj. R ²	0.029	0.032	0.159	0.139
Within R ²	0.031	0.029	0.060	0.059
<i>Panel B. White Teachers</i>				
Race Congruence	-0.019*** (0.003)	-0.013 (0.008)	-0.023** (0.007)	-0.032*** (0.009)
Race Congruence ²	0.001*** (0.000)	0.001* (0.001)	0.001** (0.000)	0.002** (0.001)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	630,597	630,597	630,597	630,597
R ²	0.023	0.029	0.292	0.296
Adj. R ²	0.023	0.024	0.150	0.149
Within R ²	0.023	0.022	0.040	0.039

Note: Coefficients from Equation 1, predicting turnover as a function of race congruence and covariates but ran separately for Black teachers and White teachers. Every model includes time-varying teacher and school covariates, such as teacher experience, graduate degree indicator, logged enrollment, proportions of students of each race/ethnicity identity, proportion of economically disadvantaged students, proportion of male students, proportion of students identified for special education services, and proportions of English language learners. Models predicting the likelihood of transfer also include, as a control, a dichotomous indicator for teacher-year observations that leave the PA dataset in order to maintain the reference category of remaining in a school. The race congruence variable is rescaled by a factor of 10, so coefficients can be interpreted as the change in likelihood of turnover for a 10 percentage point increase in racially congruent colleagues. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Appendix C3. Non-Parametric Operationalization of Race Congruence Predictor
Appendix Table C3.1. Estimated effects of racially congruent colleagues on teacher turnover for any pathway out

	(1)	(2)	(3)	(4)
<i>Panel A. Black Teachers</i>				
0-10% (refcat)				
11-20%	-0.002 (0.009)	0.063*** (0.016)	-0.011 (0.016)	0.003 (0.016)
21-30%	0.023+ (0.012)	0.115*** (0.021)	-0.011 (0.021)	0.012 (0.021)
31-40%	0.018 (0.013)	0.141*** (0.024)	-0.016 (0.024)	-0.009 (0.025)
41-50%	0.018 (0.014)	0.143*** (0.027)	-0.049+ (0.026)	-0.035 (0.028)
51-60%	0.046** (0.017)	0.177*** (0.032)	-0.018 (0.030)	-0.002 (0.033)
61-70%	0.035 (0.023)	0.196*** (0.038)	-0.016 (0.038)	0.016 (0.039)
71-80%	0.022 (0.038)	0.210*** (0.052)	-0.032 (0.048)	0.007 (0.050)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	21,922	21,922	21,922	21,922
R ²	0.024	0.092	0.312	0.388
Adj. R ²	0.022	0.051	0.155	0.208
Within R ²	0.024	0.012	0.028	0.047
<i>Panel B. White Teachers</i>				
0-10% (refcat)				
11-20%	-0.561* (0.222)	-0.644* (0.253)	-0.253 (0.215)	-0.447+ (0.268)
21-30%	-0.564** (0.215)	-0.563* (0.247)	-0.238 (0.205)	-0.395 (0.262)
31-40%	-0.482* (0.214)	-0.447+ (0.245)	-0.210 (0.202)	-0.360 (0.260)
41-50%	-0.543* (0.213)	-0.386 (0.245)	-0.253 (0.202)	-0.360 (0.260)
51-60%	-0.560** (0.213)	-0.335 (0.245)	-0.253 (0.202)	-0.335 (0.260)
61-70%	-0.583** (0.213)	-0.319 (0.245)	-0.288 (0.202)	-0.349 (0.260)
71-80%	-0.607** (0.213)	-0.323 (0.245)	-0.306 (0.202)	-0.359 (0.260)
81-90%	-0.604** (0.213)	-0.312 (0.245)	-0.314 (0.202)	-0.359 (0.260)
91-100%	-0.606** (0.213)	-0.309 (0.245)	-0.320 (0.202)	-0.365 (0.260)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	630,597	630,597	630,597	630,597
R ²	0.018	0.065	0.262	0.311
Adj. R ²	0.018	0.060	0.113	0.167
Within R ²	0.018	0.009	0.026	0.027

Note: Coefficients from Equation 1, predicting turnover as a function of race congruence and covariates but ran separately for Black teachers and White teachers. Every model includes time-varying teacher and school covariates, such as teacher experience, graduate degree indicator, logged enrollment, proportions of students of each race/ethnicity identity, proportion of economically disadvantaged students, proportion of male students, proportion of students identified for special education services, and proportions of English language learners. Models predicting the likelihood of transfer also include, as a control, a dichotomous indicator for teacher-year observations that leave the PA dataset in order to maintain the reference category of remaining in a school. The race congruence variable is rescaled by a factor of 10, so coefficients can be interpreted as the change in likelihood of turnover for a 10 percentage point increase in racially congruent colleagues. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Appendix Table C3.2. Estimated effects of racially congruent colleagues on teacher transfer

	(1)	(2)	(3)	(4)
<i>Panel A. Black Teachers</i>				
0-10% (refcat)				
11-20%	-0.001 (0.007)	0.048*** (0.013)	-0.003 (0.013)	0.013 (0.012)
21-30%	0.025* (0.010)	0.098*** (0.018)	0.005 (0.018)	0.031+ (0.016)
31-40%	0.022* (0.011)	0.112*** (0.021)	0.001 (0.021)	0.014 (0.020)
41-50%	0.011 (0.012)	0.101*** (0.023)	-0.033 (0.023)	-0.012 (0.023)
51-60%	0.042** (0.014)	0.130*** (0.027)	-0.013 (0.027)	0.011 (0.027)
61-70%	0.025 (0.019)	0.135*** (0.033)	-0.023 (0.034)	0.016 (0.033)
71-80%	0.018 (0.031)	0.142** (0.044)	-0.039 (0.045)	0.008 (0.045)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	21,922	21,922	21,922	21,922
R ²	0.035	0.105	0.310	0.409
Adj. R ²	0.034	0.065	0.153	0.235
Within R ²	0.035	0.021	0.030	0.023
<i>Panel B. White Teachers</i>				
0-10% (refcat)				
11-20%	-0.397 (0.252)	-0.484 (0.295)	-0.304 (0.285)	-0.501+ (0.276)
21-30%	-0.398 (0.248)	-0.395 (0.291)	-0.255 (0.278)	-0.408 (0.271)
31-40%	-0.306 (0.247)	-0.274 (0.290)	-0.199 (0.277)	-0.344 (0.269)
41-50%	-0.351 (0.247)	-0.207 (0.290)	-0.231 (0.276)	-0.324 (0.270)
51-60%	-0.357 (0.247)	-0.154 (0.290)	-0.223 (0.276)	-0.288 (0.270)
61-70%	-0.373 (0.247)	-0.138 (0.290)	-0.247 (0.276)	-0.290 (0.270)
71-80%	-0.396 (0.247)	-0.151 (0.290)	-0.268 (0.276)	-0.305 (0.270)
81-90%	-0.388 (0.247)	-0.140 (0.291)	-0.274 (0.276)	-0.304 (0.270)
91-100%	-0.390 (0.247)	-0.140 (0.291)	-0.280 (0.276)	-0.310 (0.270)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	630,597	630,597	630,597	630,597
R ²	0.025	0.094	0.249	0.323
Adj. R ²	0.025	0.090	0.098	0.183
Within R ²	0.025	0.011	0.024	0.005

Note: Coefficients from Equation 1, predicting turnover as a function of race congruence and covariates but ran separately for Black teachers and White teachers. Every model includes time-varying teacher and school covariates, such as teacher experience, graduate degree indicator, logged enrollment, proportions of students of each race/ethnicity identity, proportion of economically disadvantaged students, proportion of male students, proportion of students identified for special education services, and proportions of English language learners. Models predicting the likelihood of transfer also include, as a control, a dichotomous indicator for teacher-year observations that leave the PA dataset in order to maintain the reference category of remaining in a school. The race congruence variable is rescaled by a factor of 10, so coefficients can be interpreted as the change in the likelihood of turnover for a 10 percentage point increase in racially congruent colleagues. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Appendix Table C3.3. Estimated effects of racially congruent colleagues on leaving PA education

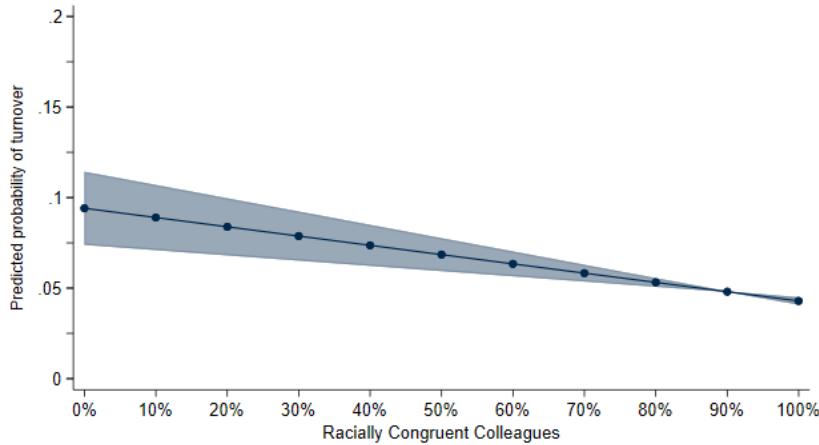
	(1)	(2)	(3)	(4)
<i>Panel A. Black Teachers</i>				
0-10% (refcat)				
11-20%	-0.001 (0.005)	0.017+ (0.010)	-0.010 (0.009)	-0.012 (0.011)
21-30%	-0.002 (0.007)	0.018 (0.012)	-0.019+ (0.011)	-0.021 (0.013)
31-40%	-0.005 (0.008)	0.032* (0.014)	-0.020 (0.012)	-0.026+ (0.015)
41-50%	0.008 (0.008)	0.046** (0.016)	-0.018 (0.014)	-0.026 (0.018)
51-60%	0.004 (0.010)	0.052** (0.018)	-0.006 (0.016)	-0.015 (0.020)
61-70%	0.012 (0.013)	0.068** (0.022)	0.007 (0.019)	-0.000 (0.023)
71-80%	0.004 (0.023)	0.076* (0.032)	0.009 (0.029)	-0.001 (0.031)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	21,922	21,922	21,922	21,922
R ²	0.031	0.073	0.315	0.335
Adj. R ²	0.029	0.031	0.159	0.139
Within R ²	0.031	0.028	0.060	0.060
<i>Panel B. White Teachers</i>				
0-10% (refcat)				
11-20%	-0.171 (0.218)	-0.167 (0.218)	0.053 (0.285)	0.057 (0.301)
21-30%	-0.173 (0.215)	-0.176 (0.216)	0.018 (0.283)	0.013 (0.300)
31-40%	-0.183 (0.214)	-0.181 (0.215)	-0.011 (0.282)	-0.017 (0.299)
41-50%	-0.201 (0.214)	-0.187 (0.214)	-0.023 (0.282)	-0.039 (0.299)
51-60%	-0.212 (0.214)	-0.189 (0.214)	-0.032 (0.282)	-0.049 (0.299)
61-70%	-0.219 (0.214)	-0.189 (0.214)	-0.042 (0.282)	-0.061 (0.299)
71-80%	-0.219 (0.214)	-0.180 (0.214)	-0.039 (0.282)	-0.056 (0.299)
81-90%	-0.225 (0.214)	-0.180 (0.214)	-0.042 (0.282)	-0.058 (0.299)
91-100%	-0.225 (0.214)	-0.177 (0.214)	-0.041 (0.282)	-0.057 (0.299)
School FE		X		X
Teacher FE			X	X
Year FE	X	X	X	X
Observations	630,597	630,597	630,597	630,597
R ²	0.023	0.029	0.292	0.296
Adj. R ²	0.023	0.024	0.150	0.149
Within R ²	0.023	0.022	0.040	0.040

Note: Coefficients from Equation 1, predicting turnover as a function of race congruence and covariates but ran separately for Black teachers and White teachers. Every model includes time-varying teacher and school covariates, such as teacher experience, graduate degree indicator, logged enrollment, proportions of students of each race/ethnicity identity, proportion of economically disadvantaged students, proportion of male students, proportion of students identified for special education services, and proportions of English language learners. Models predicting the likelihood of transfer also include, as a control, a dichotomous indicator for teacher-year observations that leave the PA dataset in order to maintain the reference category of remaining in a school. The race congruence variable is rescaled by a factor of 10, so coefficients can be interpreted as the change in likelihood of turnover for a 10 percentage point increase in racially congruent colleagues. + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

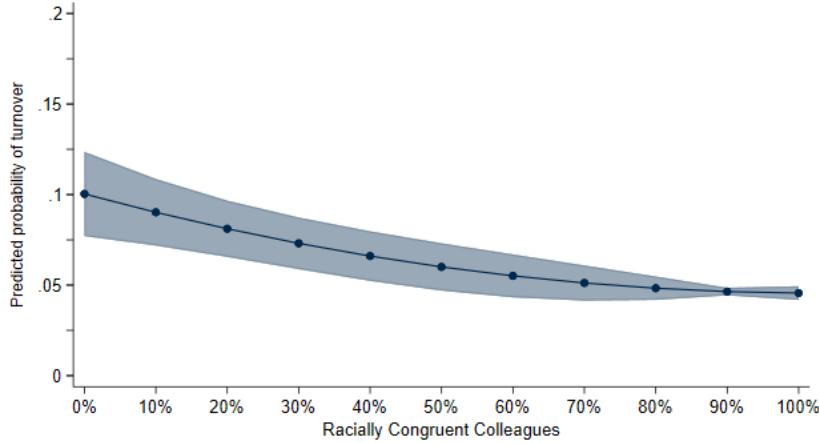
Appendix D: Marginal Effects for Transfer and Leave PA Outcomes

Appendix Figure D1. Marginal effects on teacher transfer by racially congruent colleagues

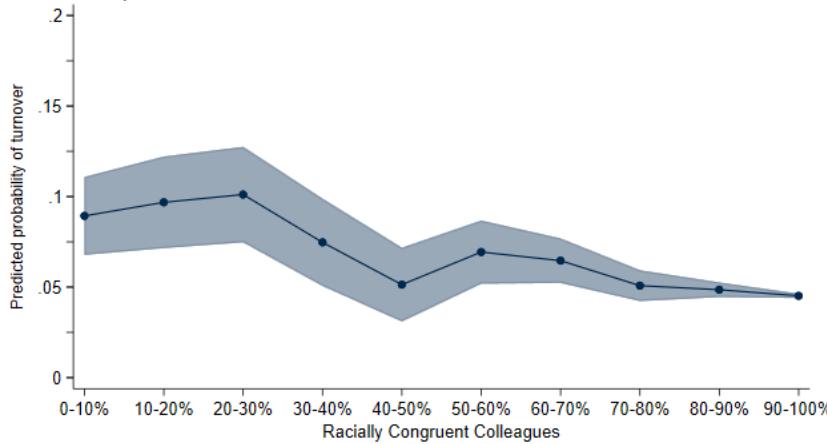
Panel A. Linear



Panel B. Quadratic



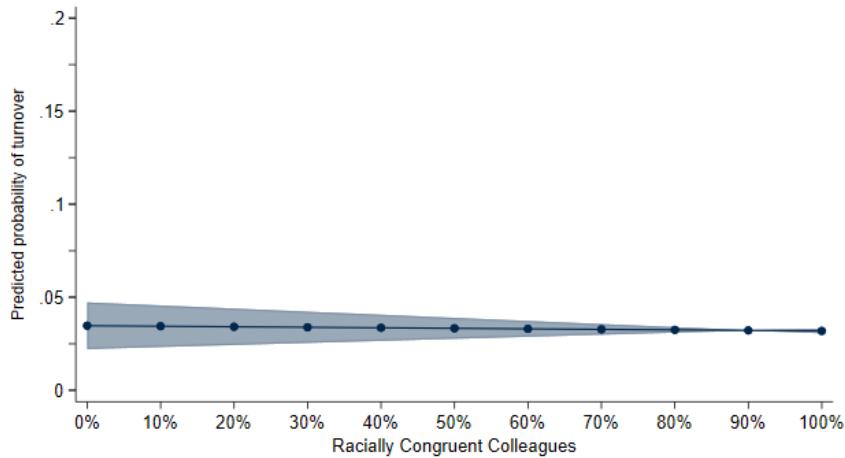
Panel C. Spline



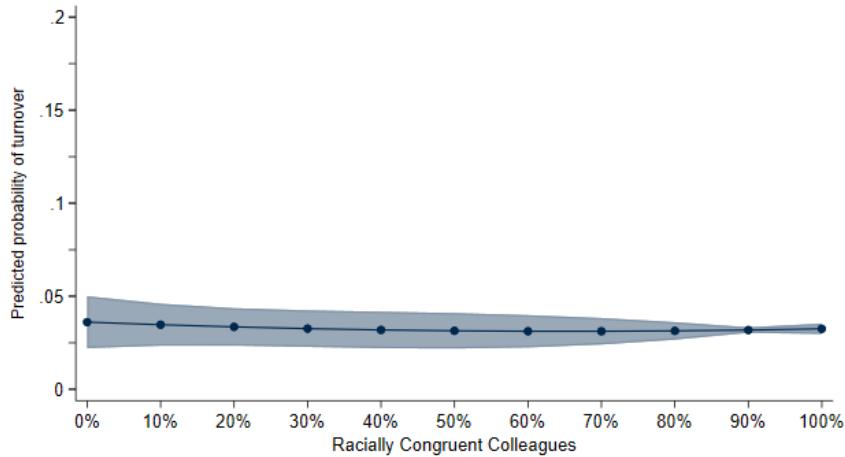
Note: This figure presents conditional marginal effects on teacher transfer as presented in Equation 2. See Figure 2 in main text for analogous estimates on teacher turnover for any pathway.

Appendix Figure D2. Marginal effects on teachers leaving PA education by racially congruent colleagues

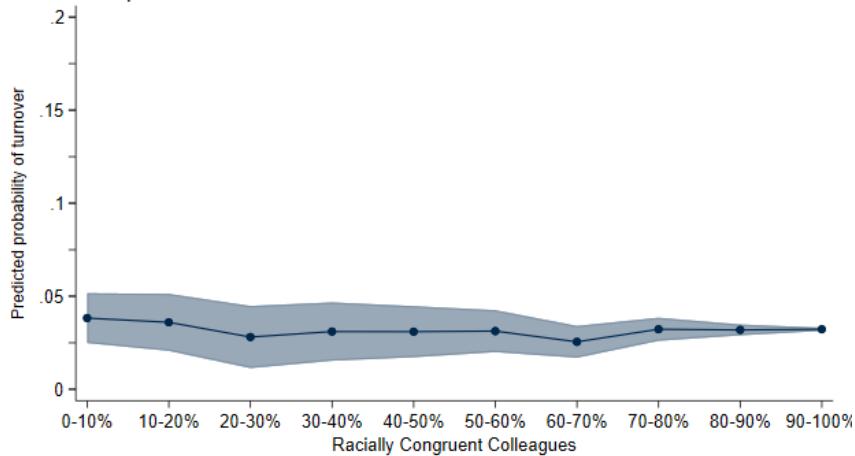
Panel A. Linear



Panel B. Quadratic



Panel C. Spline



Note: This figure presents conditional marginal effects on teacher's leaving PA education as presented in Equation 2. See Figure 2 in main text for analogous estimates on teacher turnover for any pathway.